Vol. 66, No. 15 Whole No. 347, 1952

Psychological Monographs: General and Applied

The Academic Achievement of Veteran and Nonveteran Students[1]

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I. PLAN OF THE STUDY

A. Purposes of the Study

In the period 1945-1950, American colleges were crowded with students, a large proportion of whom were veterans of World War II. In part, the influx was an outcome of a new feature in the educational scene—the educational provisions of the federal law commonly called the GI Bill of Rights. Many of these veteran students would not have attended college without the aid thus provided. At the beginning, considerable concern was expressed regarding the possible effects of combat and of other features of wartime service upon the adjustment of veterans to the life of colleges typically designed for a less widely experienced student body.

The experience of university faculties quickly demonstrated that the more pessimistic views were unfounded. University teachers and deans reported that the veterans were alert and industrious students, that their influence on the undergraduate body was wholesome, and that the incidence of events that could be traced to battle shock was much smaller than had been anticipated. Numerous articles were published in newspapers and popular magazines in which rather glowing accounts of the scholastic success of veteran students were presented. Veteran students were almost universally reported to be superior to nonveterans in academic achievement.

The Carnegie Foundation for the Advancement of Teaching became interested in the problem of the academic success of the veteran student in college, and the College Entrance Examination Board was requested to make a study investigating the relationship between veteran-nonveteran status and academic success in college. The College Board agreed to conduct such an investigation, with the support of the Carnegie Corporation. The primary objectives of the study were to answer the following questions:

1. Do veteran students make better grades in college, in relation to their ability, than nonveteran students?
2. What light does information about background, attitudes, and other qualities throw upon veteran-nonveteran differences?
3. How do veterans who could not have attended college without the financial assistance provided through the GI Bill compare with veteran students who were financially able to attend college?

[1] This monograph is based on Chapters I, II, and III of *Adjustment to College: A Study of 10,000 Veteran and Nonveteran Students in Sixteen American Colleges* (privately printed in a limited edition by the Educational Testing Service, 1951). The study was conducted by the College Entrance Examination Board and the Educational Testing Service with the support of the Carnegie Corporation of New York. That Corporation does not, however, necessarily endorse the statements made or views expressed herein.

This report is concerned with the first of the three questions—the comparison of veteran and nonveteran students with respect to grades relative to ability.

The analysis of the data needed to study this question would furnish information relating to numerous other questions of interest to educators. How well can scholastic success in college be predicted from aptitude-test scores and measures of high-school achievement? What improvement in prediction can be effected by combining various predictors of college success? Are there differences between veterans and nonveterans with regard to the relative effectiveness of predictors for forecasting college achievement? Of what significance is the differential in time of taking aptitude tests in relation to time of entering college? Are veterans who enter college as freshmen handicapped during the first term, in comparison with nonveterans, so that a warm-up or refresher period might be desirable? In the case of the veteran whose education was interrupted by the war, is a period of readjustment necessary, or does he come back fired with enthusiasm which leads to temporary overachievement? Questions of this sort were taken into account in designing the study.

The best opportunity for making such a study presented itself in the fall of 1946, which was the time when the maximum number of veterans (particularly veterans who had actually experienced combat overseas) were enrolling in college. It was felt that the academic year 1946-1947 was the optimal time to study the question of the effect of war service on college achievement. Students enrolled at that time would possess to a marked degree the characteristics which make veterans different from nonveterans, and would be sufficiently numerous to yield statistically stable results.

B. Selection of Colleges

It was desired that the study of veterans' achievement in college be based on data obtained from a variety of types of institutions, including coeducational and men's colleges, private colleges and colleges supported by state or municipal funds, large and small institutions, colleges with various curricular emphases (such as liberal arts, engineering, and agriculture), both heavily endowed colleges and colleges with less endowment, and colleges representing various geographical regions of the United States. It was also desired that pairs of colleges with roughly the same characteristics be chosen. Further restrictions in the choice of colleges included adequate numbers of students, availability of suitable data, and willingness of the college to participate in the study.

A tentative list of 36 colleges which seemed to meet the criteria for inclusion in the study was prepared. Letters were sent to the presidents of the 36 colleges by Dr. O. C. Carmichael of the Carnegie Foundation for the Advancement of Teaching; each letter briefly described the objectives of the study. A few days later a letter and a brief questionnaire were sent from the College Entrance Examination Board to the same persons. Anonymity of the colleges in the published report was promised to the institutions who wished to participate in the study.

The questionnaire sent to the college presidents was designed to provide information which would be useful in judging whether or not the institution was an appropriate one to include in the study from the standpoint of adequacy of data. It furnished a convenient and uniform method for the college to report: (*a*) the number of veteran and nonveteran students entering each college or division of the university in the fall of 1945 and in the fall of 1946; (*b*) information regarding the program of intelligence or scholastic-aptitude testing, including names of tests used, whether tests were normally taken near the completion of secondary school or at the time of entrance to college, and the pro-

portion of students having scores; (*c*) whether or not some over-all measure of achievement (such as average grade or grade-point average) was routinely available for these students; (*d*) what specific courses were taken in common by all or by a large proportion of the freshman students; and (*e*) whether or not some measure of scholastic success in high school was available for a large proportion of the entering freshmen. A question was included to ascertain whether or not the institution wished to participate in the study.

Twenty-six of the colleges indicated that they wished to participate in the veterans' study and returned questionnaires. Seven institutions could not or did not wish to participate, and from the remaining three colleges there was no reply or a noncommittal reply, with no reply to follow-up letters. Nine of the 26 colleges which expressed willingness to participate in the study were not included because of an inadequate number of cases in one or more of the groups to be studied or because of the lack of certain crucial information. Data were obtained from 17 colleges. One institution was dropped from the study after the data had been collected, since needed data were available for too few students, so that the statistical analysis is based on groups from 16 colleges and universities.

The participating colleges will be referred to in this report by code names. The private colleges were given pseudonyms which are common American surnames assigned at random with no attempt to make the name carry any implication as to any characteristic of the institution. The publicly supported institutions, including both state and municipal colleges, were given geographical names which describe in a general way the location of the institution. The following is a list, by geographical section, giving the code name and a brief description of each institution:

Eastern City University: A coeducational publicly supported college of arts and science located in an eastern city.

Adams University: A private university for men located in an eastern city.

Stewart University: A private university for men located in a small eastern city.

Miller University: A private coeducational university located in an eastern city.

Midwest State University: A large coeducational state university located in a midwestern city.

Midwest City University: A coeducational, publicly supported university located in a midwestern city.

Littletown State University: A coeducational state university located in a small midwestern city.

Harris University: A private coeducational university located in a small midwestern city.

Evans University: A private coeducational university located in a midwestern city.

Central State University: A large coeducational state university located in a small midwestern city.

Turner University: A private coeducational university located in a midwestern city.

Midwest Technological University: A coeducational land-grant college emphasizing agriculture, engineering, and other applied arts, located in a small midwestern city.

Middle State University: A large coeducational state university located in a midwestern city.

Douglas University: A private coeducational university located in a southern city.

Southern Technological University: A coeducational land-grant college, emphasizing agriculture, engineering, and other applied arts, located in a southern city.

Western State University: A coeducational state university located in a western city.

C. Collection of Data

A member of the College Board staff visited each of the participating institutions, with the exception of Western State University, for the purpose of making detailed arrangements for the collection of data.[2] Prior to the visits, a letter was written requesting that preliminary arrangements be made for selecting a supervisor to have charge of the data collection.[3]

[2] Mr. Donald Peterson and the senior author of this report were responsible for making these arrangements with the cooperating colleges.

[3] It is regretted that individual acknowledg-

The original plan of the study called for the administration of achievement tests in mathematics, physics, or chemistry, where appropriate, for the purpose of supplementing regular course grades by objective examinations which could be used as additional criteria of academic success. Most colleges, however, were unable to cooperate in this phase of the study. Arrangements for administering achievement tests were made at only one institution. However, when the tests were actually administered and scored, it was found that the difficulty of the tests was not appropriate for the students; the results were therefore not used in this study.

1. *Groups for Whom Data Were Obtained*

Three main types of study were planned: (*a*) comparisons of male veteran students who entered in the fall of 1946 with male nonveterans who entered at the same time; (*b*) similar studies for students who entered in the fall of 1945; and (*c*) comparisons of male veterans whose college careers were interrupted by war service and who returned to college after the war with the best available control group.

Collection of data on adequate numbers of students who entered in the fall of 1946 proved to be relatively straightforward; similar efforts to obtain groups of adequate size among students entering in 1945 proved to be difficult because the nonveteran groups were frequently inadequate in size. As a result, only one of the twenty-five groups actually studied was limited to students entering during the academic year 1945-1946. In a few other instances, students entering in the fall of 1945 were pooled with students entering in the fall of 1946 for analysis.

In the collection of data for the study of veterans whose schooling was interrupted, the basic plan was to limit the group to veterans who had completed one year prior to interruption and one year after interruption. For three groups, this plan was followed. In two additional groups of interrupted veterans, however, it was found desirable to increase the flexibility of the defining pattern in order to obtain larger groups.

Logically, it would seem desirable to use male nonveterans who had experienced a similar interruption for comparison with the interrupted veterans. In practice, however, it proved to be impossible to locate more than thirty interrupted nonveterans in any one group. Consequently, nonveterans whose schooling was not interrupted, but who were otherwise as similar as possible to the interrupted veterans, were selected for this purpose. Thus, for three of the groups, male nonveterans who entered in the fall of 1945 and who completed two full academic years consecutively formed the comparison group. For the two interrupted groups including veterans having a flexible pattern of interruption, the uninterrupted nonveteran comparison group was composed of students entering in the fall of 1939. Care was taken, of course, to ensure that there was no reason to doubt the comparability of grading standards before determining that the control group was suitable.

2. *Criterion Data*

The criterion data included average grades, as determined by the college in which the student was enrolled or by calculation from data supplied by the college. In addition, grades in specific courses, such as English or mathematics,

ment in this report is precluded by the decision that complete anonymity of the colleges should be maintained.

were obtained in cases where the course had been taken by all or practically all the students.

Other types of criterion data which were considered and included in certain instances were such variables as academic standing (e.g., "good standing, probation, dropped"), number of visits to the health department for psychiatric problems, and attendance. Because of the very small proportion of students in these extreme categories, however, and for other practical reasons, these data were not used in the statistical analysis.

3. *Predictor Variables*

The colleges had originally been selected in part on the basis of the availability of adequate predictor data. Scores on some intelligence or scholastic aptitude test were available in all colleges; the most usual test of this sort was the American Council Psychological Examination (ACPE). In most cases, some measure of high-school achievement was also obtained, such as high-school average grade or rank in high-school class. In addition to the intelligence-test score and high-school grade, other data which were thought to be potentially good predictors of college achievement were included, achievement tests used by the college for admissions or for sectioning being the most common example. In some colleges composite scores or predicted freshman grades were available, and these were also included. Still other variables of theoretical interest were obtained, although they were not expected to be good predictors of achievement. Examples of such variables are date of high-school graduation and date of taking aptitude and achievement tests; there was considerable variability on these factors for veteran students in certain institutions.

A variety of methods of recording data were used—hand-copying to rosters, photostats, microfilm, and punched cards—depending upon such considerations as cost and the facilities available at the particular institution.

D. Analysis of Data

The primary purpose of the analysis of academic data was to determine whether or not veteran students made higher grades, in relation to their ability, than did nonveteran students. In order to obtain as precise a comparison as possible, it was considered essential to analyze data separately for each university, and, in institutions of complex organization, separately for each college or division. Analyses were based on groups homogeneous with respect to institution attended, the division within that university in which enrolled, and time of entrance in college. Each such group included both veteran and nonveteran male students. A total of twenty-five separate groups were defined by this process. The groups within each institution are shown in Table 1.

Colleges where differentiation into various divisions is delayed until after the freshman or sophomore year are classified as colleges of arts and science in this study. In all, 17 groups were from colleges of arts and science (so defined), 4 were from engineering colleges, 2 from colleges of business, 1 from an agricultural college, and 6 groups involved interrupted veterans from arts and science and technological colleges.

1. *Preparation of the Academic Data*

In defining the specific students from each college to be included in the statistical analyses and in making the numerous detailed decisions required before analysis could begin, primary consideration was given to two objectives: (*a*) to

TABLE 1

THE TWENTY-FIVE GROUPS INCLUDED IN THE STUDY, ARRANGED ACCORDING TO UNIVERSITY

University	Division	Time of Entrance	Number of Cases MV*	Number of Cases MN*
Adams	Arts & Science	Fall 1946	531	694
Adams	Arts & Science	Fall 1945†	134	111
Central State	Arts & Science	Fall 1946	466	166
Central State	Arts & Science	Fall or Winter 1945	135	59
Douglas	Arts & Science	Fall 1946	77	119
Eastern City	Arts & Science	Fall 1946	53	147
Eastern City	Arts & Science	Fall 1945†	70	99
Evans	Arts & Science	Fall 1946	283	94
Harris	Arts & Science	Fall 1946	105	146
Littletown State	Arts & Science	Fall 1946	103	107
Littletown State	Business	Fall 1946	142	65
Middle State	Engineering	Fall 1946	352	98
Midwest City	Arts & Science	Fall 1946	83	72
Midwest City	Engineering	Fall 1946	167	171
Midwest State	Business	Fall 1946	232	58
Midwest Technological	Agriculture	Fall 1946	140	102
Midwest Technological	Agriculture	Fall 1939†	57	106
Midwest Technological	Engineering	Fall 1946	271	128
Midwest Technological	Engineering	Fall 1939†	140	215
Miller	Arts & Science	Fall 1946	425	193
Southern Technological	Engineering	Fall 1945 or Fall 1946	120	50
Stewart	Arts & Science	Fall 1946	187	348
Stewart	Arts & Science	Fall 1945†	55	70
Taylor	Arts & Science	Fall 1945 or Fall 1946	100	101
Western State	Arts & Science	Fall 1946	433	222

* The abbreviations MV and MN stand for male veteran and male nonveteran respectively.
† The date given is for nonveterans. The veterans with whom they are compared entered college at various times and had their college careers interrupted by war service.

bring into sharp focus any basic difference in relative achievement between veteran and nonveteran students; and (*b*) to provide data which would be as comparable as possible for the 25 groups chosen for analysis.

For practical reasons, the detailed planning of the study and the preparation of the academic data for analysis developed concurrently. In order that all analyses be based on the same students within a particular college group, the inclusion of any variable on which data were not complete required the exclusion from the analysis of students who lacked data on that variable. Thus in the final determination of the members of each of the 25 subgroups it was necessary to balance the information to be obtained from a particular variable against the proportion of cases to be dropped and the size and representativeness of the sample remaining, if the variable were included. Fortunately, two facts aided greatly in making the decisions: first, many of the scores most appropriate for the study were available for substantially all cases; and second, it was necessary or desirable to exclude students lacking data on certain variables (e.g., first-year grades) as a means of defining the sample.

2. *Generalized Description of the Samples*

The students included in the various studies were male veteran students or male nonveteran students who belonged to one of the 25 groups chosen for study. These groups were defined in terms of the college or university, the college class (e.g., freshman in the fall of 1946) and the university division (e.g., college of arts and science). In general, each student included had earned a definite amount of college credit at specified periods of time. He had complete data on all variables chosen for statistical analysis in his group. He had not attended, as a civilian student, any other

college or university; and in most groups, he had not received substantial credit (10 quarter hours) in specific courses for college work he had taken while in the armed services. In universities having several divisions, he had been enrolled in the designated division during the entire defined period, which was typically one academic year. Except for the editing on credit for armed-service college-training programs, the procedures were uniform for veterans and nonveterans. Typically, the veterans and nonveterans were not separated until the editing was completed.

Direct comparisons of grades of veterans and nonveterans (excepting only the "interrupted" groups) are thus limited to grades earned at the same time, in the same university, and in the same division within the university by veteran and nonveteran students. Students who have done part of their academic work at another college are excluded and veteran students who had extensive college training in basic academic subjects during their military career are usually excluded from the comparisons.

3. *The Method of Analysis*

The first step in the actual analysis was to compute the intercorrelations of predictor and criterion variables.[4] For each group, separate tables of intercorrelations were computed for male veterans and male nonveterans. For certain institutions (Midwest Tech, Middle State, Western State, Douglas, and Adams) a larger number of variables was studied than for the remaining institutions. The more complete analyses were in general made in instances where they were justified by the size of the sample or by the availability of variables thought to be of particular interest.

The basic design of this study required a comparison of the achievement of veterans and nonveterans after allowing for the effects of ability differences between the two groups. Since it was decided that the appropriate procedure for allowing for ability differences involved the use of regression equations, a more general approach to the comparison was followed. In effect, the question was raised: would the same regression line (or plane) provide an adequate description of achievement in relation to ability for both groups? It is apparent that there are several ways in which the regression equations might differ. Thus, for a given set of predictors, grades of one group might be predicted more accurately than would be true of the other group. Again, the relative weights for obtaining best prediction might differ in the two groups. Finally, the constant terms in the two regression equations might be different. Each of these possible differences is meaningful. For the purposes of this study, however, results are most readily interpreted if it turns out that the predictors yield equally effective prediction (as measured by the standard error of estimate) and that the predictors may be assumed to have the same slopes in both groups. If these two conditions hold, the difference in constant terms of the regression equation provides a general measure of the difference between the

[4] The extensive tabulations and analyses required by this study were executed by the Department of Statistical Analysis, of which Dr. Ledyard R Tucker is director. Particular acknowledgments are also due to Mr. Harry Garrison, who was in charge of the International Business Machines work, to Miss Henrietta Gallagher, who coordinated the analysis, and to Mrs. Judith Aronson, Head of the Computing Section.

two groups in achievement relative to ability.

The importance of being able to assume the same slope for both groups is illustrated in Figure 1. If the regression equation for each group were taken at face value, the conclusion would be that the advantage for veterans scoring high on the American Council Psychological Examination is greater than that for veterans at the low end of the distribution. When it is recognized that the differences in slope may properly be attributed to sampling fluctuations, a more general conclusion regarding veteran-nonveteran differences in achievement relative to ability may be drawn.

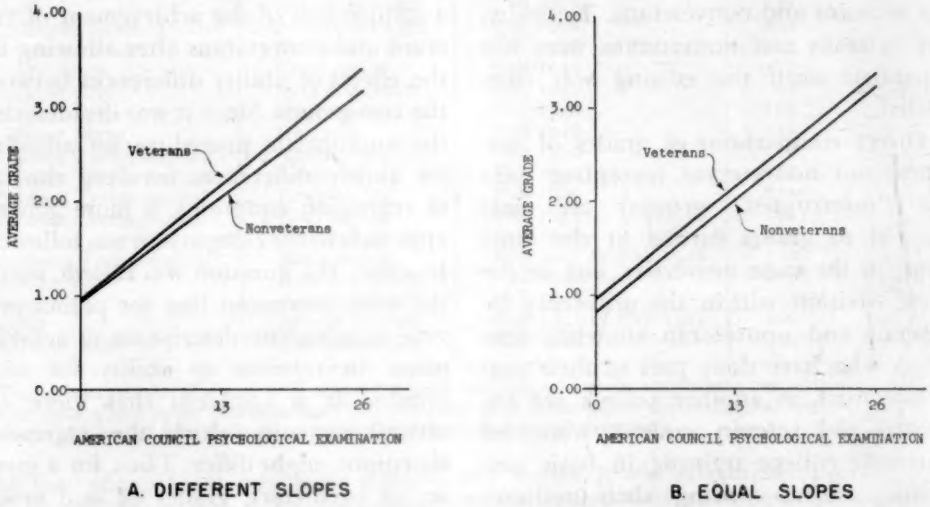

FIG. 1. Comparison of Veterans and Nonveterans Using Different Slopes (A) and Equal Slopes (B) (Based on data from Evans University)

The three aspects of the regression equation considered in the foregoing paragraphs correspond to the three steps in the analysis of covariance method described by Gulliksen and Wilks.[5] The method permits one to test successively three hypotheses regarding the regressions of a criterion on a predictor for two (or more) groups. Hypothesis A is the hypothesis that the errors of estimate about the regression lines (or planes) are the same for both (or all) groups; Hypothesis B is the hypothesis that the slopes of the regression lines (or planes) are the same; and Hypothesis C is the hypothesis that the intercepts of the regression lines (or planes) on the criterion axis are the same. The test of Hypothesis B is legitimately applied if Hypothesis A is not disproved, and, similarly, the test of Hypothesis C is legitimately applied if the hypothesis that the regression slopes are alike is not disproved. If the intercepts of the regression lines (or planes) on the criterion axis do prove to be significantly different, the interpretation, of course, is that the members of one group show a higher performance on the criterion than do members of the second group who are of similar ability as measured by predictor scores. The method has been generalized and computational procedures have been evolved for regression planes based on more than

[5] Gulliksen, H., & Wilks, S. S. Regression tests for several samples. *Psychometrika*, 1950, 15, 91-114.

one predictor as well as for the single predictor situation.[6]

In this study, the regression lines (or planes) to be compared are the regressions of freshman average grades on the predictor or predictors chosen for a particular group for male veteran and male nonveteran students in that group. Disproof of Hypothesis C is evidence that male veterans and nonveterans of similar ability differ in their college achievement as measured by grades.

The basic conceptions of the analysis of covariance procedure suggest a convenient and meaningful method for estimating the amount of difference between two groups after allowance is made for differences in ability. In this study, the percentage of veterans excelling the average nonveteran was chosen as a suitable index.

The method of estimating the per cent of veterans who would excel the average nonveteran involved three steps. First, on the assumption that veteran and nonveteran groups could each be described by parallel regression lines or planes, the uniform vertical distance between the lines or planes along the criterion axis was computed. This result expresses the difference between the groups in terms of the grading system in use in the particular college or university. Second, recognizing that the standard error of estimate about the regression line or plane is in effect the standard deviation of grades adjusted for ability differences, the difference between veterans and nonveterans in grade units was divided by the standard deviation of grades adjusted for ability. It is apparent that the resulting measure is a standard score whose unit is a standard error of estimate. From such units the proportion of veterans who excel the average nonveteran may be estimated by use of a table of normal curve areas.

This concept is illustrated in Figure 2. The left-hand distribution is for nonveterans and the right-hand distribution is for veterans; the means of these distributions are separated by an amount equal to the difference between the regression lines (or planes) expressed in standard error of estimate units. The proportion of cases falling in the diagonally shaded area may be obtained from a table of the normal curve; this value is an appropriate estimate of the proportion of veterans excelling the average nonveteran when ability is assumed to be equivalent. In the comparisons of male veterans with male nonveterans,

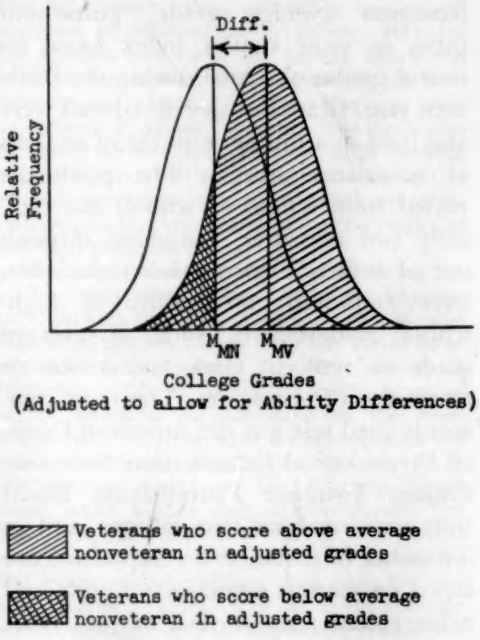

FIG. 2. Determination of the Proportion of Veterans Excelling the Average Nonveteran, Assuming Normal Distribution and Equal Standard Deviations

[6] The contribution of Dr. Ledyard R Tucker, who developed an effective, systematic procedure for computing the necessary constants aided substantially in making the use of this procedure feasible.

the per cent of *veterans* excelling the average *nonveteran* is always reported. Percentages of less than 50 then indicate superiority of the nonveteran subgroup. Percentages greater than 50 indicate superiority of the veteran subgroup.

The criterion which was uniformly used in the analyses of covariance was freshman average grade, point-hour ratio, or some similar index based on course grades obtained during the freshman year. Grades in specific courses were also used in a limited number of analysis of covariance studies. The predictors varied from school to school, but typically two measures, combined through use of multiple correlation techniques, were employed: a measure of high-school achievement, such as average grade or rank in class, and a test or composite of test scores. The most commonly used test was the American Council Psychological Examination. Scores on College Entrance Examination Board tests were used for two colleges, and in a number of instances a composite score based on various scholastic-aptitude and achievement tests or tests of tool skills was employed.

A slightly different approach was used in the case of interrupted veterans. Here it was assumed that the veteran's freshman grades, earned before war service, furnished the best possible predictor of grades earned after discharge from military service. In the typical study of interrupted veterans, therefore, the regressions of second-semester sophomore grades on first-term freshman grades for interrupted veterans and uninterrupted nonveterans were compared. The semester or quarter average grades falling between the first term of the freshman year and the last term of the sophomore year were not used in the analysis. The term just prior to induction, it was thought, might have suffered because of knowledge of the impending induction into the armed forces; and the term occurring immediately after the return from service might not have been typical, either because of need to readjust to academic life or because of a temporary enthusiasm leading to overachievement.

II. RESULTS OF THE ANALYSIS

In this section the results of the analyses of the academic data are presented. In discussing the results of comparisons in the various groups studied, the following order will be followed: (*a*) students of arts and science in private universities; (*b*) students of arts and science in state and municipal universities; (*c*) students of engineering in state and municipal universities; (*d*) students of agriculture and of business in state and municipal universities; and (*e*) interrupted veterans and their uninterrupted nonveteran control groups. Within each of these main divisions, those groups upon which the more extensive analyses were done will generally be considered first.

A. Grades of Veteran and Nonveteran Students in Arts and Science Colleges of Private Universities

1. *Adams University*

Adams University is a large private university for men. All candidates for admission are required to present scores on College Entrance Examination Board tests, along with evidence regarding their secondary-school achievement. For the 1946 group, about two-thirds of the entering students had attended private schools. Although specific courses are not required of freshmen, the selection of courses is limited, and all freshmen carry a uniform number of courses. The group of students included in this study may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed a full year's work during the academic year 1946-1947.

The predictors used in the comparison of veterans and nonveterans at Adams were the Verbal and Mathematical scores of the College Entrance Examination Board Scholastic Aptitude Test (SAT). The criterion measure is First-Year College Average Grade. Grades are "percentage" grades based on a 100-point scale. Additional predictors studied were the Adjusted School Rank, and a Predicted Grade, computed by the university, which is based on adjusted rank in school and College Board test scores. The adjustment of the rank in school is based on past records at Adams of students from each particular secondary school. The intercorrelations of the variables are shown in Table 2.

"Date of Tests" was also studied in order to determine the relationship of amount of time elapsing between testing and college entrance to measures of achievement in college. Many of the veterans had taken the College Board test prior to war service, while practically all nonveterans took the tests in the spring just prior to entrance at Adams University. The mean date of testing for veterans was found to be between 1944 and 1945, with a standard deviation of 1.12 years. It is apparent that there is sufficient variation among the veterans to make the results of the analysis meaningful.

The correlations involving year of testing are all low; they range from —.08 to .21. The correlations with term averages are .03 and .06. The highest correlation (.21) is with the Verbal score of the Scholastic Aptitude Test. This positive relationship might be accounted for in terms of higher standards for admission in the more recent years; however, such an hypothesis is not borne out by the correlations with the SAT-Mathematical score and the Adjusted School Rank, which are .02 and .08 respectively. The slightly higher correlation with the SAT-Verbal score may merely reflect growth in vocabulary and other verbal abilities with age. By and large, it appears that date of taking the aptitude tests is a matter of little importance within the limits of age and time found in this study. This finding is of considerable significance in the interpretation of data in this investigation, since in most groups the veteran students were tested after war service, while nonveterans were tested soon after graduation from high school.

The correlation of First-Semester Average Grade with Second-Semester Average Grade is .81 for each of the subgroups. This value may be considered as an indication of the reliability of semester grades, although it is presumably an underestimate. The reliability of average grade for the freshman year may be estimated at .90 or higher, using the Spearman-Brown formula.

The veteran subgroup is seen to have obtained lower mean scores than the nonveteran subgroup on all the variables on which a comparison is possible. It is particularly interesting to note that the veterans were predicted to earn a mean average grade of about 72 and they actually earned a First-Semester Average Grade of 75.4, while the nonveterans were predicted to have a mean average grade of 74.8 and actually earned

TABLE 2

INTERCORRELATIONS OF SCHOLASTIC APTITUDE TEST SCORES, DATE TESTS WERE TAKEN (FOR VETERANS ONLY), ADJUSTED SCHOOL RANK, PREDICTED GRADE, AND FIRST-YEAR COLLEGE AVERAGE GRADES

Adams University, College of Arts and Science, Freshmen, 1946–1947

		Male Nonveterans (N=694)							
		SAT-V	SAT-M	Date of Tests	Adjusted School Rank	Predicted Grade	1st-Year Average	Mean	S. D.
Male Veterans (N=531)	SAT-Verbal		.17		.31	.65	.39	565	86
	SAT-Mathematical	.23			.33	.44	.30	594	80
	Date of Tests	.21	-.02						
	Adjusted School Rank	.29	.37	-.08		.82	.60	76.2	7.0
	Predicted Grade	.62	.46	.16	.76		.65	74.8	6.0
	First-Year Average	.41	.33		.55	.63		75.8	6.4
	Mean	536	576	44.4	72.2	72.0	75.1		
	Standard Deviation	93	84	1.12	7.7	6.9	6.1		

a First-Semester Average of 75.7, a somewhat smaller difference.

It was found that the best single predictor, for both veterans and nonveterans, is the Predicted Grade, and that the Adjusted School Rank alone was nearly as good, especially for nonveterans. The Predicted Grade was tried as a variable for use in controlling ability in the analysis of covariance. It was found, however, when this variable was used, that the slopes of the regression lines were significantly different (that for nonveterans being steeper), so that the interpretation of the results of later steps would be doubtful. It was also found that the Adjusted School Rank was responsible for the different slopes. The greater slope of the regression of grades on Adjusted School Rank for nonveterans means, of course, that for a given increment in school rank there was on the average a greater increase in average grade for nonveterans than for veterans. One can only speculate as to the reason for this finding; but perhaps it is related to the nonintellectual factors which influenced high-school achievement and which have somehow been modified in veterans during the years of military service. Since the College Board test scores, used alone, did not have significantly different slopes for veterans and nonveterans, they were chosen as the predictors to be held constant. It must be added that this choice resulted in some loss of predictive effectiveness.

Results pertaining to the analysis of covariance are shown in detail in Table 3. In the first section of the table (I) are shown the intercorrelations, means, and standard deviations for the variables selected. The criterion is First-Year College Average Grade. The correlations in this instance are seen to be very similar for veterans and nonveterans. The nonveterans obtained higher average scores for both the Verbal and Mathematical parts of the Scholastic Aptitude Test, and their Freshman Average Grade was also slightly higher. Variability of test scores was slightly greater for veterans, as shown by larger standard deviations, but the nonveterans were slightly more variable with respect to average grades. Part II of Table 3 shows that the multiple correlations, based on the two SAT scores, are .48 and .46 for veterans and nonveterans respectively. For both subgroups combined, the multiple correlation is .47. In interpreting these correlations, it is important to remember that the tests were used in selection of the students; the resulting curtailment in vari-

TABLE 3

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Adams University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: SAT-Verbal	Correlation with: SAT-Math.	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. Scholastic Aptitude Test-Verbal	MV		.23	.41	536	93	531
	MN		.17	.39	565	86	694
2. Scholastic Aptitude Test-Mathematical	MV	.23		.33	576	84	531
	MN	.17		.30	594	80	694
3. First-Year College Average Grade	MV	.41	.33		75.1	6.1	531
	MN	.39	.30		75.8	6.4	694

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .48; for MN, .46; and for the combined group, .47.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	2.008	1	Between .10 and .20
B. Equality of slopes	0.733	2	Between .50 and .70
C. Equality of intercepts	1.213	1	Between .20 and .30

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.36
Advantage expressed in standard error of estimate units	0.06
Per cent of veterans excelling the average nonveteran	52
Level of significance of difference (from IIIC above)	Not significant

ability of test scores has presumably lowered the correlations to some extent.

Part III of the table presents the results of the three significance tests in the analysis of covariance. Differences in errors of estimate and slopes are not significant. The intercepts of the regression planes, also, are not significantly different; when ability (as measured by SAT scores) is made equivalent, the grades earned by veterans and nonveterans are too similar to warrant the conclusion that either group is superior.

Part IV of the table highlights the findings: The veterans have a slight advantage over nonveterans of equivalent ability; the advantage, expressed in Adams University grade units, is .36. (In terms of the mean *grades* shown in Part I of the table, the *nonveterans* have an advantage of .7.) The advantage of the veterans, expressed in standard error of estimate units, is only .06. Perhaps the most meaningful measure of the veteran students' advantage is the percentage of veterans found to exceed the average nonveteran in grades adjusted for ability differences; in the case of Adams, this turns out to be only 52. If there were no difference, this percentage would of course be 50. The difference, as noted above, is too small to be statistically significant.

2. *Stewart University*

For the Stewart University students entering as freshmen in 1946, the analysis design was much like that for Adams. At Stewart, intercorrelations among College Board Scholastic Aptitude Test scores, Adjusted School Rank, date of taking admissions tests, and First-Year College Average Grades were obtained. In comparing the relative achievement of veteran and nonveteran male students, allowance was made for three predictors: Scholastic Aptitude Test-Verbal, Scholastic Aptitude Test-Mathematical, and

Adjusted School Rank.

Stewart is a private institution for men, similar in many respects to Adams University. Students are required to present College Board scores, along with their secondary-school records, for admission. As at Adams, the majority (about three-fourths) of the 1946 entering students had attended private schools. As freshmen, Stewart students select their program within a restricted framework. The group of entering freshmen may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed a full year's work during the academic year 1946-1947. Since all students carry a fixed number of courses, it was not necessary to consider variations in academic load in defining the sample.

The statistical results involved in the comparison of achievement of veteran and nonveteran students are presented in Table 4. The predictors again included the College Board SAT scores, both Verbal and Mathematical. Their predictive value was very nearly the same as at Adams. Adjusted School Rank was also used at Stewart, and its predictive value was high ($r = .53$ for veterans and .62 for nonveterans). The multiple correlations (based on all three predictors) were higher than for Adams because of the inclusion of the measure of high-school achievement. As at Adams, the nonveteran students on the average had higher scores on all the predictors and also a higher First-Year Average Grade. The actual difference in mean grades is .31 on the grading system used at Stewart. Stewart uses a seven-step grading system; in this analysis, the highest grade was given the value 7, the next 6, and so on, 1 being the lowest.

The analysis of covariance results show that the hypotheses of equal errors of estimate and equal slopes of regression planes are not dis-

TABLE 4

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Stewart University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: SAT-Verbal	SAT-Math.	Adj. School Rank	1st-Yr. Average Grade	Mean	*SD*	*N*
1. Scholastic Aptitude Test-Verbal	MV		.21	.29	.40	536	86	187
	MN		.09	.31	.40	570	82	348
2. Scholastic Aptitude Test-Mathematical	MV	.21		.32	.28	570	77	187
	MN	.09		.37	.25	590	74	348
3. Adjusted School Rank	MV	.29	.32		.53	4.12	.76	187
	MN	.31	.37		.62	4.70	.78	348
4. First-Year College Average Grade	MV	.40	.28	.53		4.76	.77	187
	MN	.40	.25	.62		5.07	.83	348

II. Multiple Correlations (Variables 1, 2, and 3 vs. Variable 4): for MV, .60; for MN, .66; and for the combined group, .65.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.014	1	Between .90 and .95
B. Equality of slopes	3.375	3	Between .30 and .50
C. Equality of intercepts	2.143	1	Between .10 and .20

IV. Difference between Subgroups with Ability Held Constant:

	Male Veteran
Superior subgroup	
Advantage expressed in grade units	0.09
Advantage expressed in standard error of estimate units	0.14
Per cent of veterans excelling the average nonveteran	56
Level of significance of difference (from IIIC above)	Not significant

TABLE 5

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Douglas University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: H. S. Average Grade	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. ACPE Total (raw score)	MV		.13	.35	106	19	77
	MN		.32	.55	117	20	119
2. High-School Average Grade	MV	.13		.52	3.26	2.04	77
	MN	.32		.65	4.07	2.30	119
3. First-Year College Average Grade	MV	.35	.52		1.14	.64	77
	MN	.55	.65		1.40	.75	119

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .59; for MN, .74; and for the combined group, .71.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.0506	1	Between .80 and .90
B. Equality of slopes	2.048	2	Between .30 and .50
C. Equality of intercepts	0.0587	1	Between .80 and .90

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.02
Advantage expressed in standard error of estimate units	0.04
Per cent of veterans excelling the average nonveteran	52
Level of significance of difference (from IIIC above)	Not significant

proved. The difference between veteran and nonveteran students in intercepts of their regression planes is well within the range of chance expectancy. The advantage of the veteran is again found not to be significant when account is taken of differences in ability.

In addition to the variables directly involved in the analysis of covariance, attention was given to the year during which College Board tests were taken. The results for this variable were similar to those found at Adams. While practically all the nonveteran students were tested in 1946, the mean date of testing for veterans was midway between 1944 and 1945, with a standard deviation of one year. The correlations of year of testing with other variables ranged from .10 (with Adjusted School Rank) to —.04 (with SAT-M and First-Year Average Grade). The correlation with SAT-V was .07 at Stewart. The time of testing was again found to be a factor of negligible importance within the conditions of this study.

3. *Douglas University*

Douglas is the first of many groups for which American Council Psychological Examination scores were available. It is the only liberal arts group for which the relation of year of high-school graduation to the other variables was studied.

Douglas University is a coeducational private university located in a southern city. Admission to Douglas depends primarily upon the student's secondary-school record. In the 1946 group, about 45 per cent had attended private schools. Certain required courses are set up for freshmen in arts and science, required subjects being English, mathematics, and social science. The group studied at Douglas met the following requirements: all entered as beginning freshmen in the fall of 1946 and completed three full quarters during the academic year 1946-1947.

The predictors used in the comparison of veterans and nonveterans at Douglas were total

score on the ACE Psychological Examination and High-School Average Grade. The high-school grade, which was expressed in letters, was converted into numerical form as follows: A = 8, A− = 7, B+ = 6, B = 5, B− = 4, etc. The criterion measure is First-Year College Average Grade. Grades were based on a four-category scale, the units of which had numerical values of 3 to 0.

In addition to the variables included in the analysis of covariance, year of high-school graduation was studied for male veterans only. The average veteran in this group was graduated from high school in 1944; there was considerable variability as indicated by a standard deviation of 1.7 years. The correlation of year of graduation with ACPE total score was −.06; with High-School Average Grade, it was −.18; and with First-Year College Average Grade, it was −.28. Thus there was a slight tendency for the veterans who had been out of school longer to have higher grades both in high school and college.

The results of the analysis of covariance are shown in Table 5. The American Council Psychological Examination total score and High-School Average Grade were chosen as predictors. The multiple correlations were found to be .59 and .74 for veterans and nonveterans respectively, and .71 for both subgroups combined. The higher validities for nonveterans is undoubtedly due in part to their greater variability.

Differences in errors of estimate and slopes of the regression planes were found to be no greater than would be expected by chance, and the difference in intercepts of the regression planes was also not significant. When account is taken of differences between the subgroups in ability, the mean difference in freshman average grade is only .02 (in favor of the veterans) as compared with a difference of .26 (in favor of the nonveterans) when no adjustment is made. In standard error of estimate units, the difference is .04; 52 per cent of the veterans excel the average nonveteran.

TABLE 6

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Harris University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with:			Mean	*SD*	*N*
		Composite Test	H. S. Rank	1st-Yr. Average Grade			
1. Composite Test	MV		.46	.55	164	28	105
	MN		.54	.52	175	32	146
2. High-School Rank (converted score)	MV	.46		.49	15.0	3.0	105
	MN	.54		.65	17.2	3.4	146
3. First-Year College Average Grade	MV	.55	.49		1.20	.72	105
	MN	.52	.65		1.43	.71	146

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .61; for MN, .68; and for the combined group, .65.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.901	1	Between .30 and .50
B. Equality of slopes	4.024	2	Between .10 and .20
C. Equality of intercepts	0.676	1	Between .30 and .50

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.06
Advantage expressed in standard error of estimate units	0.11
Per cent of veterans excelling the average nonveteran	54
Level of significance of difference (from IIIC above)	Not significant

4. *Harris University*

The analysis of data for students in Harris University was limited to that necessary for a comparison of relative achievement of veteran and nonveteran students after allowing for differences in high-school standing and a composite score based on five entrance tests.

Harris is a coeducational private midwestern college of arts and science which is bound by ties of tradition to one of the major religious denominations. Harris students are drawn from the upper half of their high-school graduating classes. Freshmen choose their own program within a series of general requirements, only English being specifically required. For study at Harris University, the following group of students was selected: students who entered as beginning freshmen in the fall of 1946 and who completed substantially a full year's work during the academic year 1946-1947.

The predictors used at Harris included High-School Rank and a Composite Test score. (High-School Rank was converted to a standard-score scale having a mean of 13 and a standard deviation of 4.) The composite score, which is computed routinely at Harris, is based on the American Council Psychological Examination (1942 edition) and four Form T Cooperative tests: the Cooperative English Test and the three Cooperative General Achievement Tests in social studies, natural sciences, and mathematics. The composite score was obtained by adding to the ACPE total score twice the sum of the scaled scores on the four achievement tests, after both the ACPE total and the sum of the scaled scores had been converted to standard scores based on local norms. The criterion as usual is the First-Year College Average Grade. A six-step grading system is used at Harris; in this analysis, the numerical equivalents of the steps were 3, 2, 1, 0, −1, and −2.

The results of the analysis are shown in Table 6. The nonveterans at Harris proved to be

TABLE 7

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Miller University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: H. S. Rank	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. ACPE (1946) Total (raw score)	MV		.26	.41	111	20	425
	MN		.32	.39	112	20	193
2. High-School Rank (converted score)	MV	.26		.43	14.8	3.3	425
	MN	.32		.58	15.8	3.4	193
3. First-Year College Average Grade	MV	.41	.43		1.49	.56	425
	MN	.39	.58		1.50	.64	193

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .53; for MN, .62; and for the combined group, .56.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	1.136	1	Between .20 and .30
B. Equality of slopes	7.027	2	Between .02 and .05
C. Equality of intercepts	2.732	1	Between .20 and .30

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.07
Advantage expressed in standard error of estimate units	0.14
Per cent of veterans excelling the average nonveteran	56
Level of significance of difference (from IIIC above)	Not significant

TABLE 8

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Evans University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
ACPE Total (converted score)	MV		.51	12.0	3.3	283
	MN		.45	13.1	3.1	94
First-Year College Average Grade	MV	.51		2.10	.61	283
	MN	.45		2.05	.60	94

Validity coefficient for combined group: .49

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.0285	1	Between .80 and .90
B. Equality of slopes	0.148	1	Between .70 and .80
C. Equality of intercepts	5.504	1	Between .01 and .02

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.15
Advantage expressed in standard error of estimate units	0.28
Per cent of veterans excelling the average nonveteran	61
Level of significance of difference (from IIC above)	2%

superior on the average to veterans on both predictor measures and also with respect to freshman average grade. Validity coefficients are satisfactorily high. The greater validity of High-School Rank for nonveterans may be due in part to the greater variability of nonveterans on this measure.

The analysis of covariance results show that the hypotheses of equality of errors of estimate and equality of slopes of regression planes are not disproved, and that the difference between the intercepts of the generalized regression planes is not significant. The veteran subgroup is slightly superior. Fifty-four per cent of the veterans exceed the average nonveteran with respect to freshman average grade at Harris. The advantage of veterans is clearly not significant.

5. *Miller University*

As at Harris, the analysis of the academic data at Miller was limited to that required for comparing the relative achievement of male veteran and nonveteran students. The predictors employed were the American Council Psychological Examination total score and High-School Rank. The criterion was First-Year College Average Grade.

Miller is a large coeducational private university located in an eastern city. Students in the College of Arts and Science are typically drawn from the upper three-fifths of graduating classes of accredited high schools. The only course required of all freshmen is English; as usual, however, the formulation of the student's program is determined in part by broader requirements. The group selected for study may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed a full year of work (eleven or more hours each semester) during the academic year 1946-1947.

Results of the analysis of data for Miller students are shown in Table 7. In interpreting means and standard deviations, the following information may be useful: The grading system at Miller is based on a five-step scale; the numerical equivalents of the categories range from 3 through 0 to −1. For use in statistical analy-

sis, High-School Rank was converted to a standard scale having a mean of 13 and a standard deviation of 4.

Male veterans tend to excel nonveteran students of equivalent ability. Fifty-six per cent of the veteran subgroup exceed the average nonveteran; but the difference is not significant. The difference in slopes of the regression planes, however, casts some doubt on the accuracy of the evaluation of the difference in intercepts.

6. *Evans University*

For students entering Evans University as freshmen, the comparison of achievement between veterans and nonveterans was carried out using only a single predictor—total score on the American Council Psychological Examination—as a basis for equating aptitude. The criterion, as usual, was First-Year College Average Grade. Evans is a coeducational, private, church-connected college of arts and science located in a midwestern city. Admission is based typically upon the high-school record of the student. At Evans, English is a required subject; the remaining requirements in the freshman program allow some choice of subjects. The group chosen for analysis at Evans was limited to students entering as beginning freshmen in the fall of 1946 who completed two semesters of eleven or more hours each during the academic year 1946-1947.

The results of the analysis are shown in Table 8. The percentage of veterans exceeding the average nonveteran was found to be 61; this advantage of the veterans is significant at the 2 per cent level.

7. *Turner University*

At least two special features characterize the analysis of data for freshmen at Turner University: first, the average grades are based on achievement-test scores used by the college rather than on the course grades; and second, students entering in the fall of 1945 have been combined with those entering in the fall of 1946 in making up the group. The inclusion

TABLE 9

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Turner University, College of Arts and Science

(Students who entered as freshmen in fall, 1945, or fall, 1946)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: Composite Test	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
Composite Test (converted score)	MV		.61	66.3	7.3	100
	MN		.60	68.1	8.0	101
First-Year College Average Grade	MV	.61		2.47	.66	100
	MN	.60		2.73	.81	101

Validity coefficient for combined group: .61

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	4.5403	1	Between .02 and .05
B. Equality of slopes	0.2406	1	Between .50 and .70
C. Equality of intercepts	3.7527	1	Between .05 and .10

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Nonveteran
Advantage expressed in grade units	0.16
Advantage expressed in standard error of estimate units	0.28
Per cent of veterans excelling the average nonveteran	39
Level of significance of difference (from IIC above)	Not significant

of both years was necessary in order to obtain a group of sufficient size.

Turner University is a private coeducational university located in a large midwestern city. In addition to the student's high-school record, a special battery of tests is used in the admissions procedure. The customary departmental divisions are minimized in the freshman program of Turner students. Students who entered as beginning freshmen in the fall of 1945 or in the fall of 1946, and who had data on three comprehensive examinations taken during the first year—including one in physical or biological science and one in another typical freshman course—constituted the group for analysis.

The predictor was a Composite Test score based on the American Council Psychological Examination total score, a test of reading comprehension, and a test of writing skills, the last two tests having been prepared at Turner.

It was found through the analysis of covariance (Table 9) that the difference in standard errors of estimate was significant at the 5 per cent level: the grades of veterans were somewhat more predictable than those of nonveterans. This finding casts some doubt on the legitimacy of testing the other two hypotheses concerning the regression lines. The remaining two tests were carried out; their results must be interpreted with caution. It was found that the slopes were not significantly different and that the difference in intercepts was not significant.

Turner is the first institution so far encountered where the nonveteran students are superior to veteran students. Only 39 per cent of the veterans at Turner exceed the average nonveteran. It should be kept in mind that the results based on adjusted grades must be discounted somewhat in view of the rejection of Hypothesis A; it is believed, however, that the tendency for nonveterans to excel the veterans is a valid finding for the present data.

8. *Summary*

Summarizing the results for the private institutions, it is found that the superior subgroup in six instances is the male veteran and in only one instance the male nonveteran subgroup. The difference favoring veterans is significant at the 2 per cent level for one group; none of the other differences is significant.

The validity coefficients obtained for tests of ability are in general very similar for veterans and nonveterans; but for measures based on high-school standing, the predictive value is consistently greater for the nonveteran subgroups. This finding appears to be reasonable in the light of the greater time elapsing between high-school graduation and college entrance for veterans than for nonveterans, permitting greater opportunity for change in motivation, interests, efficiency of work habits, etc. Evidence from Adams and Stewart, where there was considerable variation in the time of taking tests, indicates that the time of testing has little effect on the predictive value of the tests and little relationship to the predictive measures.

B. Grades of Veteran and Nonveteran Students in Arts and Science Colleges of State and Municipal Universities

1. *Western State University*

At Western State, the predictors used in the comparison of veterans and nonveterans were total score on the American Council Psychological Examination and High-School Average Grade. The criterion measure was the average grade earned during the freshman year. Some attention was given to the intercorrelations of average grades during the three quarters of the freshman year.

Western State University is a large coeducational institution. The typical within-state student is admitted primarily on the basis of his high-school record, the basic standard being an average grade of "C" or higher. As a freshman in the college of arts and science, he is required to take English; otherwise, his program is determined by broader requirements. The group included in the analysis may be defined as follows: students who entered in the fall of 1946 as beginning freshmen and who completed ten or more quarter hours of work during each of the three quarters. Students who were not enrolled in freshman English during any of the three quarters were excluded in order to increase the homogeneity of the group.

The grading scale at Western State includes five steps, with numerical values of 4 to 0. The average intercorrelation of grades for the nonveterans was .64; for veterans, the corresponding figure was .61. Assuming that the reliability of quarter average grades for men is .62, use of the Spearman-Brown formula would suggest that the reliability of the freshman average

TABLE 10

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Western State University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with: ACPE	Correlation with: H. S. Average Grade	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. ACPE Total (raw score)	MV		.36	.46	114	22	433
	MN		.47	.51	114	21	222
2. High-School Average Grade	MV	.36		.53	2.69	.50	433
	MN	.47		.59	2.93	.51	222
3. First-Year College Average Grade	MV	.46	.53		2.39	.62	433
	MN	.51	.59		2.43	.56	222

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .60; for MN, .65; and for the combined group, .61.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	6.0537	1	Between .01 and .02
B. Equality of slopes	0.3921	2	Between .80 and .90
C. Equality of intercepts	4.5398	1	Between .02 and .05

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.09
Advantage expressed in standard error of estimate units	0.18
Per cent of veterans excelling the average nonveteran	57
Level of significance of difference (from IIIC above)	Ambiguous

grade variable is about .83. This value is probably an underestimate as compared with the hypothetical split-half reliability.

Turning to the analysis of covariance results shown in Table 10, we see that the standard errors of estimate are significantly different at the 2 per cent level. Strictly speaking the slopes are therefore not comparable. The test becomes fairly sensitive, however, with a group as large as that employed in this analysis, so it was considered permissible to proceed to the tests of Hypotheses B and C. We find that 57 per cent of the veterans excel the average nonveteran. It may be concluded that the grades of veteran students are less predictable than those of nonveterans; the difference in errors of estimate is significant at the 2 per cent level. The grades of the veterans are more variable than those of nonveterans, perhaps because of greater heterogeneity with regard to courses chosen by veteran students. The findings with regard to superiority in grades relative to ability are ambiguous.

2. *Central State University*

At Central State, two separate groups were studied. The first of these included freshmen entering in 1946; the second, freshmen entering in 1945. The latter group was unique in the study; in no other institution were veteran and nonveteran male students who entered in 1945 compared. For the 1946 group, the comparison of achievement of veterans and nonveterans was made after allowing for differences in High-School Average Grade and in a composite entrance-test score. For the 1945 group, only the Composite Test was used in the analysis of covariance.

Central State is a large midwestern state university which admits students living in the state upon completion of an appropriate high-

school course of study. As usual, freshmen in arts and science found that their program permitted a number of alternative ways of meeting various requirements; only English was a required course. For the larger group at Central State, the following definition may be stated: male students who entered as freshmen in the fall of 1946 and who completed two semesters of academic work during the academic year 1946-1947.

The following information may be useful in interpreting the results presented in Table 11. The Composite Test score was reported as a percentile rank based on six tests: Correctness and Effectiveness of Expression, Reading Materials in Social Studies, Reading Materials in Natural Science, Interpretation of Literary Materials, General Mathematical Ability, and General Vocabulary. The percentile scores were converted to a standard scale with a mean of 13 and a standard deviation of 4. The criterion was the First-Year College Average Grade. The grading system used five categories having the numerical values 4 to 0.

The results for students entering in the fall of 1946 are presented in Table 11. It will be noted that the Composite Test has a somewhat higher validity for veterans than for nonveterans, and that the validity of High-School Average is the same for both subgroups; in most institutions it has been found that high-school standing is more predictive of college grades for nonveterans than for veterans. Sixty-five per cent of the male veterans excel the average nonveteran, the most extreme difference so far encountered. The difference in freshman grades, when aptitude is considered, is highly significant.

The group of students which entered in 1945 may be defined as follows: male students who entered in the fall or winter semester of 1945, and who completed at least three semesters

TABLE 11

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Central State University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with: Composite Test	Correlation with: H. S. Avg. Grade	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. Composite Test (converted score)	MV		.48	.58	12.5	3.9	466
	MN		.43	.51	13.5	3.6	166
2. High-School Average Grade	MV	.48		.61	2.48	.62	466
	MN	.43		.61	2.74	.64	166
3. First-Year College Average Grade	MV	.58	.61		2.20	.68	466
	MN	.51	.61		2.19	.66	166

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .69; for MN, .67; and for the combined group, .68.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.016	1	Between .80 and .90
B. Equality of slopes	0.815	2	Between .50 and .70
C. Equality of intercepts	17.753	1	Less than .01

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.19
Advantage expressed in standard error of estimate units	0.39
Per cent of veterans excelling the average nonveteran	65
Level of significance of difference (from IIIC above)	1%

TABLE 12

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Central State University, College of Arts and Science

(Students entering as freshmen during the academic year 1945–1946)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: Composite Test	Correlation with: 1st. 3 Sem. Average Grade	Mean	*SD*	*N*
Composite Test (converted score)	MV		.43	13.5	3.8	135
	MN		.49	14.5	4.2	59
First Three Semesters College Average Grade	MV	.43		2.36	.53	135
	MN	.49		2.38	.65	59

Validity coefficient for combined group: .45

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	2.792	1	Between .05 and .10
B. Equality of slopes	0.795	1	Between .30 and .50
C. Equality of intercepts	0.313	1	Between .50 and .70

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.04
Advantage expressed in standard error of estimate units	0.09
Per cent of veterans excelling the average nonveteran	54
Level of significance of difference (from IIC above)	Not significant

before the summer of 1947. An eight-week summer term was counted as one semester for three of the 135 veterans.

The analysis plan for the group entering in 1945 differed from that for the 1946 group in only two respects: First Three-Semesters College Average Grade was used as the criterion, and High-School Average was not included in the analysis of covariance. Basic results are shown in Table 12. The number of cases is rather small for the 1945 group; the results must therefore be interpreted with caution.

The validity coefficients for the Composite Test score were .43 and .49 for veterans and nonveterans respectively. Those for High-School Average turned out to be .33 and .65 for the two subgroups. Since the use of both predictors yielded regression planes which differed reliably in slope (at the 2 per cent level of significance), it was decided to use only the Composite Test as the predictor. From Table 12 it may be seen that 54 per cent of the veterans exceed the average nonveteran in average grade.

3. *Littletown State University*

Two groups, both entering as freshmen in the fall of 1946, were studied at Littletown State. Of these, the group entering the College of Arts and Science will be discussed in this section; the other group, which entered the College of Business, will be discussed in a later section. For the arts and science students, the analysis was limited to a comparison of the achievement of veteran and nonveteran students after allowing for differences in American Council Psychological Examination total scores.

Littletown State University is a coeducational state university located in a small midwestern city. Students are drawn mainly from the high schools of the state, and are admitted on the basis of high-school graduation. Stu-

TABLE 13

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Littletown State University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
ACPE Total (raw score)	MV		.49	111	23	103
	MN		.34	115	20	107
First-Year College Average Grade	MV	.49		2.29	.68	103
	MN	.34		2.35	.69	107

Validity coefficient for combined group: .42

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.814	1	Between .30 and .50
B. Equality of slopes	0.464	1	Between .30 and .50
C. Equality of intercepts	0.00193	1	Between .95 and .98

III. Difference between Subgroups Ability Held Constant:

Superior subgroup	Male Nonveteran
Advantage expressed in grade units	0.00
Advantage expressed in standard error of estimate units	0.01
Per cent of veterans excelling the average nonveteran	50
Level of significance of difference (from IIC above)	Not significant

dents with poor averages in high school are admitted on a probationary basis. Freshmen in arts and science are required to take an English course; the remainder of their program is determined by broader requirements. The sample under consideration may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed eleven or more hours of work in the College of Arts and Science in each of the two semesters of the academic year, 1946-1947. The criterion, First-Year College Average Grade, was actually a point-hour ratio, based on a scale of five steps having the numerical values of 4 to 0. Raw scores on the ACPE were used.

The results are shown in Table 13. When allowance is made for ability differences the average grades of veterans and nonveterans at Littletown State are almost identical and, of course, the very slight difference in favor of nonveterans is not significant.

4. *Eastern City University*

For students entering Eastern City in the fall of 1946, the analysis was limited to a comparison of male veteran and nonveteran students, after allowing for differences in aptitude reflected in High-School Average Grade and Composite Score on entrance tests. The criterion measure was First-Year College Average Grade.

Eastern City is a coeducational municipal college of arts and science located in a large city. Students are admitted to Eastern City on a competitive basis, using primarily their high-school records and their scores on entrance examinations administered by the college. Although the freshman program in arts and science is not prescribed, a relatively large number of required courses, in English, mathematics, and social sciences, must be completed before graduation.

The groups selected for statistical analysis may be described as follows: male students who enrolled as beginning freshmen in the fall of 1946 and who completed two semesters of academic work. The limitation of the group to students entering in the fall greatly reduced the number of veterans available for study, since many veterans had been admitted during the

TABLE 14

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Eastern City University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: Composite Test+H. S. Average	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
Composite Test Score plus High-School Average	MV		.45	165.5	4.6	53
	MN		.54	167.5	6.5	147
First-Year College Average Grade	MV	.45		0.26	.53	53
	MN	.54		0.37	.59	147

Validity coefficient for combined group: .53

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.128	1	Between .70 and .80
B. Equality of slopes	0.0184	1	Between .80 and .90
C. Equality of intercepts	0.0414	1	Between .80 and .90

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Nonveteran
Advantage expressed in grade units	0.02
Advantage expressed in standard error of estimate units	0.04
Per cent of veterans excelling the average nonveteran	48
Level of significance of difference (from IIC above)	Not significant

previous spring. It was considered desirable, however, to exclude these veterans in order to obtain as comparable conditions as possible between veteran and nonveteran students.

For the statistical analysis, High-School Average and Composite Test score were combined, using equal weights. (The standard deviations were roughly equal.) The Composite Test score was based on performance on eight Cooperative tests: Mechanics of Expression, Effectiveness of Expression, Vocabulary, Speed of Comprehension, Level of Comprehension, Mathematics, Natural Science, and Social Studies. The results of the analysis are presented in Table 14. Forty-eight per cent of the veterans exceed the average nonveteran; the amount of overlapping of the distributions is very great, and, of course, the difference is not significant.

5. *Midwest City University*

Two groups, both entering as freshmen in 1946, were studied at Midwest City. The present section is concerned only with those entering the College of Arts and Science. For Midwest City students, the analysis was limited to a comparison of the relative achievement of male veteran and nonveteran students after eliminating the effect of differences in performance on the American Council Psychological Examination.

Midwest City is a large coeducational municipally supported institution. Students are admitted on the basis primarily of high-school record, being selected from students graduated in the upper two-thirds of their graduating classes. Freshmen in arts and science are required to take English and a survey course in western civilization and to fulfill additional broader requirements. The group studied may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed seven or more semester hours of academic work during each semester.

Total raw scores on the ACPE were used as the only predictor for this group. The criterion, the First-Year College Average Grade, is based on a scale of six points corresponding to the values 5 to 0. The results of the analysis are shown in Table 15.

An unusually large difference between the

TABLE 15

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Midwest City University, College of Arts and Science, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	$\frac{83}{N}$
ACPE Total (raw score)	MV		.57	120	23	
	MN		.29	120	23	83
						72
First-Year College Average Grade	MV	.57		3.40	.77	
	MN	.29		3.18	.80	72

Validity coefficient for combined group: .44

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	2.872	1	Between .05 and .10
B. Equality of slopes	3.323	1	Between .05 and .10
C. Equality of intercepts	3.622	1	Between .05 and .10

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.22
Advantage expressed in standard error of estimate units	0.31
Per cent of veterans excelling the average nonveteran	62
Level of significance of difference (from IIC above)	Not significant

validity coefficients for veterans and nonveterans was found for this group at Midwest City; the correlations are .57 and .29 for veterans and nonveterans respectively. Although 62 per cent of the veterans exceed the average nonveteran, the difference is not significant because of the small number of cases.

6. *Summary*

The results for the six groups from five state and municipal colleges of arts and science are in general similar to those found for the private institutions. For the private colleges, the veterans showed higher achievement in six out of seven cases, but the difference was significant (at the 2 per cent level) in only one case. For the public arts colleges, the veterans were superior in four out of six cases. The superiority of the veterans was significant at the 1 per cent level for one institution (Central State). At another (Western State) the results of the significance test were ambiguous because of difference in errors of estimate, which was significant at the 2 per cent level.

The tendency for high-school standing to have greater validity for nonveterans than for veterans is verified in one case, but at Central State the coefficient was the same for both subgroups.

C. Grades of Veteran and Nonveteran Students in Engineering Colleges of State and Municipal Universities

1. *Midwest Technological University*

At Midwest Technological University, a number of variables were studied in addition to those employed in the basic comparisons of veterans and nonveterans, which took into account High-School Average Grade and total score on the ACE Psychological Examination. For this group, attention was given to placement tests in English and mathematics, to the average grades and credits earned during each quarter, and to course grades in English and in mathematics.

Midwest Technological University is a land-grant college in a state which also supports a state university. Students who are residents of the state are admitted upon completion of an appropriate high-school program. Students in the different branches of engineering take a common freshman year, which includes chemistry, drawing, English, college algebra, trigonometry, and analytic geometry. The group selected for study may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed three quarters of engineering college work, with ten or more hours of academic work each quarter. The criterion, quarter average grade for the three semesters of the freshman college year, is based on a five-step scale with the numerical values 4 to 0.

Comparison of the means of veterans and nonveterans on the predictive measures showed that the average veteran excelled on only one predictor, the English test, although the differences were generally small. On the mathematics placement test, the advantage of the nonveterans amounted to about half of a standard deviation. Veterans were higher in college average grades during each quarter and in the courses studied separately, as well as in over-

TABLE 16

Comparison of Average Grades Earned by Veteran and Nonveteran Male Students

Midwest Technological University, College of Engineering, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: H. S. Average Grade	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. ACPE (1945) Total (converted score)	MV		.44	.60	13.7	3.5	271
	MN		.37	.61	14.4	3.5	128
2. High-School Average Grade	MV	.44		.62	2.75	.62	217
	MN	.37		.53	2.96	.56	128
3. First-Year College Average Grade	MV	.60	.62		2.39	.63	271
	MN	.61	.53		2.24	.63	128

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .72; for MN, .76; and for the combined group, .70.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.601	1	Between .30 and .50
B. Equality of slopes	1.718	2	Between .30 and .50
C. Equality of intercepts	39.780	1	Less than .01

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.30
Advantage expressed in standard error of estimate units	0.70
Per cent of veterans excelling the average nonveteran	76
Level of significance of difference (from IIIC above)	1%

all average for the year. The mean number of credits was greater for nonveterans in each of the three quarters. Correlations between number of credits for each quarter and average grade for that quarter were found to be low and positive, for veterans and nonveterans separately, indicating a tendency for the better students to take heavier course loads.

The intercorrelations of the quarter averages ranged from .70 to .78 for nonveterans and from .68 to .75 for veterans, the average for each group being about .73. Assuming a reliability of .73 for the quarter averages, use of the Spearman-Brown formula would predict that the reliability of average grades based on the three quarters would be .89. When it is recalled that this method of estimating reliability tends to give an underestimate (because the three quarter grades are not random thirds of the freshman average grade), this figure may be considered satisfactorily high.

The results of the analysis of covariance are shown in Table 16. The multiple correlations of the ACPE in combination with High-School Average are unusually high: .72 and .76 for veterans and nonveterans respectively, and .70 for both subgroups combined. There is a marked tendency for veterans to earn higher grades than nonveterans of equal ability as measured by the predictors used. Seventy-six per cent of the veterans exceed the average nonveteran, which is the largest difference found in the study of twenty-five different groups.

2. *Middle State University*

At Middle State, a number of predictors and criteria were studied. Here, American Council Psychological Examination total score, High-School Rank, Year of High-School Graduation, First-Year College Average Grade, and course grades in drawing and mathematics were ana-

TABLE 17

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Middle State University, College of Engineering, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with: ACPE	H. S. Rank	1st-Yr. Average Grade	Mean	*SD*	*N*
1. ACPE (1937) Total (raw score)	MV		.46	.42	88.1	21.5	352
	MN		.49	.28	93.1	22.3	98
2. High-School Rank (converted score)	MV	.46		.51	15.6	3.1	352
	MN	.49		.53	16.4	3.3	98
3. First-Year College Average Grade (4-step scale)	MV	.42	.51		1.40	.66	352
	MN	.28	.53		1.32	.60	98

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .56; for MN, .53; and for the combined group, .53.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.913	1	Between .30 and .50
B. Equality of slopes	4.702	2	Between .05 and .10
C. Equality of intercepts	8.816	1	Less than .01

IV. Difference between Subgroups with Ability Held Constant:

	Male Veteran
Superior subgroup	
Advantage expressed in grade units	0.19
Advantage expressed in standard error of estimate units	0.34
Per cent of veterans excelling the average nonveteran	63
Level of significance of difference (from IIIC above)	1%

TABLE 18

COMPARISON OF DRAWING GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Middle State University, College of Engineering, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with: ACPE	Correlation with: H. S. Rank	Correlation with: Drawing Grade	Mean	*SD*	*N*
1. ACPE (1937) Total (raw score)	MV		.46	.23	88.1	21.5	352
	MN		.49	.18	93.1	22.3	98
2. High-School Rank (converted score)	MV	.46		.27	15.6	3.1	352
	MN	.49		.14	16.4	3.3	98
3. Drawing Grade—First Quarter (5-step scale)	MV	.23	.27		0.71	.83	352
	MN	.18	.14		0.53	.91	98

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .30; for MN, .19; and for the combined group, .26.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	2.197	1	Between .10 and .20
B. Equality of slopes	1.492	2	Between .30 and .50
C. Equality of intercepts	6.849	1	Less than .01

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.25
Advantage expressed in standard error of estimate units	0.30
Per cent of veterans excelling the average nonveteran	62
Level of significance of difference (from IIIC above)	1%

lyzed. A unique feature of the analysis of Middle State data is the comparison of veterans with nonveterans not only on the basis of First-Year Average Grade, but also on their grades in mathematics and drawing. In all three comparisons, differences in High-School Rank and in ACPE total score were taken into account.

Middle State is a large state university located in a midwestern city. Students of engineering are drawn from graduates ranking in the upper half of their high-school classes. Chemistry, English, mathematics, and drawing are required courses for engineering students. The group studied may be defined as follows: students who were admitted to the College of Engineering as freshmen in the fall of 1946 and who completed three quarters of work, including eleven or more hours each quarter.

The predictors employed in the study included total score on the 1937 edition of the American Council Psychological Examination (expressed in terms of raw score) and High-School Rank. The ACPE was given to high-school students in their senior year throughout the state. Rank in high-school class was converted from percentile ranks to a standard scale with a mean of 13 and a standard deviation of 4.

The principal criterion employed is the First-Year College Average Grade based on a four-category scale having the equivalent numerical values of 3 to 0. First-quarter grades in engineering, drawing, and mathematics were used as additional criteria. For these variables, a five-step grading scale was used, the values ranging from 3 to —1. Still another variable, Year of High-School Graduation, was used.

Study of the year of high-school graduation showed that most nonveterans were graduated in 1946, while the typical veteran last attended high school in 1943. Veterans, of course, showed much greater variability with respect to this measure. For veterans the correlations involving year of graduation range from .20 (with High-School Rank) to —.01 (with Drawing

Grade). Except for the r of —.01, the remaining four correlations are positive and above .08, which indicates a very slight tendency for the more recent high-school graduates to be superior. Such a relationship could easily result from admissions policy or a process of self-selection and does not necessarily reflect a general tendency.

The best predictor of First-Year Average Grade is High-School Rank. The ACPE yields a validity coefficient for veterans which is considerably higher than for nonveterans; the coefficients are .42 and .28. As might be expected, the Drawing Grades are not well predicted by either of the predictive measures used. Validity coefficients for Mathematics Grades are somewhat higher and are of about the same magnitude for veterans and nonveterans.

It may be noted that the correlations between Mathematics Grades and First-Year College Average Grades were .75 for nonveterans and .76 for veterans; the corresponding figures for Drawing Grades with Average Grades were .35 and .50. The correlations between Drawing Grades and Mathematics Grades were .19 for nonveterans and .30 for veterans.

Three analyses of covariance were computed for the data at Middle State University, one for each of the criteria employed. The results for First-Year College Average Grade are shown in Table 17. The advantage of veteran students in First-Year Average Grade at the College of Engineering at Middle State University is highly significant.

Table 18 presents the results where Drawing Grade is used as the criterion. This criterion is less predictable than either of the others; the three multiple correlations are .30, .19, and .26. The intercepts are significantly different at the 1 per cent level.

The results of the analysis of covariance in which Mathematics Grade is used as the cri-

TABLE 19

COMPARISON OF MATHEMATICS GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Middle State University, College of Engineering, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with: ACPE	H. S. Rank	Math. Grade	Mean	*SD*	*N*
1. ACPE (1937) Total (raw score)	MV		.46	.34	88.1	21.5	352
	MN		.49	.28	93.1	22.3	98
2. High-School Rank (converted score)	MV	.46		.41	15.6	3.1	352
	MN	.49		.40	16.4	3.3	98
3. Mathematics Grade—First Quarter (5-step scale)	MV	.34	.41		0.49	1.10	352
	MN	.28	.40		0.39	1.10	98

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .44; for MN, .41; and for the combined group, .43.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.0566	1	Between .80 and .90
B. Equality of slopes	0.725	2	Between .50 and .70
C. Equality of intercepts	4.342	1	Between .02 and .05

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.24
Advantage expressed in standard error of estimate units	0.24
Per cent of veterans excelling the average nonveteran	59
Level of significance of difference (from IIIC above)	5%

TABLE 20

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Midwest City University, College of Engineering, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Sub-group	Correlation with: ACPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
ACPE Total (raw score)	MV		.45	118	19	167
	MN		.36	115	20	171
First-Year College Average Grade	MV	.45		3.34	.74	167
	MN	.36		3.32	.77	171

Validity coefficient for combined group: .40

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	1.184	1	Between .20 and .30
B. Equality of slopes	0.646	1	Between .30 and .50
C. Equality of intercepts	0.101	1	Between .70 and .80

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Nonveteran
Advantage expressed in grade units	0.02
Advantage expressed in standard error of estimate units	0.03
Per cent of veterans excelling the average nonveteran	49
Level of significance of difference (from IIC above)	Not significant

terion are shown in Table 19. The intercepts are significantly different at the 5 per cent level in the case of this criterion.

For all three criteria used at Middle State, then, the veterans proved to achieve significantly higher grades than nonveterans when allowance is made for the difference in ability. When Mathematics Grade is used as the criterion, however, the difference is significant at only the 5 per cent level.

3. *Midwest City University*

The analysis of data for engineering students at Midwest City was limited to a comparison of their relative first-year grades after allowing for differences in total score on the American Council Psychological Examination.

Like the students in arts and science, Midwest City engineering students are drawn from the upper two-thirds of their high-school graduating classes. As freshmen, they take English, drawing, descriptive geometry, chemistry, college algebra, trigonometry, analytic geometry, and mechanics. The engineering program at Midwest City is well known for its practical emphasis. The sample upon which the analysis was based may be defined as follows: students entering as beginning freshmen in the fall term of 1946 who completed the full academic year 1946-1947.

The results of the analysis are shown in Table 20. In the College of Engineering at Midwest City the veteran and nonveteran students are unusually similar with respect to college achievement in relation to aptitude.

4. *Southern Technological University*

Analysis of data for engineering students at Southern Tech was limited to a comparison of the relative achievement of male veteran and nonveteran students after allowing for differences in total score on the American Council Psychological Examination. In order to secure enough cases to warrant analysis, it was necessary to combine students who entered in the fall of 1945 with those who entered in the fall of 1946.

Southern Tech is the land-grant college for

TABLE 21

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Southern Technological University, College of Engineering

(Students who entered as freshmen in fall, 1945, or fall, 1946)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
ACPE Total (raw score)	MV		.48	111	21	120
	MN		.41	109	21	50
First-Year College Average Grade	MV	.48		2.50	.70	120
	MN	.41		2.22	.60	50

Validity coefficient for combined group: .46

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.956	1	Between .30 and .50
B. Equality of slopes	0.885	1	Between .30 and .50
C. Equality of intercepts	6.110	1	Between .01 and .02

III. Difference between Subgroups with Ability Held Constant:

	Male Veteran
Superior subgroup	
Advantage expressed in grade units	0.25
Advantage expressed in standard error of estimate units	0.42
Per cent of veterans excelling the average nonveteran	66
Level of significance of difference (from IIC above)	2%

white students in a state which also supports a state university. Students are admitted upon completion of an appropriate high-school course. Engineering students carry a freshman program which includes chemistry, English, algebra, trigonometry, analytic geometry, drawing, descriptive geometry, and shop. The group studied may be defined as follows: students who entered as beginning freshmen either in the fall of 1945 or the fall of 1946 and who completed three quarters of engineering work (including eleven or more credits per quarter) during the academic year in which they entered. Students who received ten or more credits in specific subjects for training received while in the armed services were not considered to be "beginning" freshmen and were excluded.

The following information may aid in interpreting the results presented in Table 21: the criterion, First-Year College Average Grade, is based on the work of the three quarters of the freshman year. Grades are based on a five-step scale of 4 to 0. The only predictor used was the total raw score on the American Council Psychological Examination. The hypotheses of equal errors of estimate and equal slopes are not disproved, but the difference in intercepts is significant at the 2 per cent level.

5. *Summary*

In three of the four engineering schools studied, veterans were found to earn higher freshman average grades than nonveterans, when the influence of ability differences is eliminated. The difference found at two of the universities would be expected to occur by chance less than once in a hundred times, and at the third institution less than twice in a hundred. At the remaining college there was practically no difference between veteran and nonveteran students,

although what difference occurred was in favor of the nonveterans. At one university, the veterans were also found to earn better grades than nonveterans of the same ability level in two courses, drawing and mathematics.

The tendency was found at Midwest Tech for the abler students, as judged both by predictor variables and college grades, to take the heavier course loads. Nonveterans tended to take slightly heavier course loads than the veterans.

High-school standing has usually been found to predict grades better for nonveteran than veteran students, but at Midwest Tech the opposite conclusion was reached, and at Middle State the difference in validity was small.

D. Grades of Veteran and Nonveteran Students in Agriculture and Business Colleges in State Universities

1. *Midwest Technological University*

For students in the College of Agriculture at Midwest Tech, a fairly extensive analysis was undertaken. Intercorrelations of the following variables were studied: part and total scores on the American Council Psychological Examination, score on an English placement test, High-School Average, academic load carried for each quarter of the freshman college year, average grade for each quarter, and course grades in English. For the comparison of relative achievement between male veterans and male nonveterans, allowance was made for differences in total score on the ACPE and in High-School Average Grade; the criterion was First-Year College Average Grade.

Residents of the state may be admitted to the College of Agriculture at Midwest Tech upon the completion of an appropriate high-school course. English is the only course required for all agriculture students, although various other courses are required for certain large subgroups of these students. Even during the freshman year, a definite emphasis upon agricultural subjects is present, and students preparing for different specialties take somewhat different programs. The group upon which the analysis was based may be defined as follows: students who entered as beginning freshmen in the fall of 1946 and who completed three quarters of work in the College of Agriculture (including ten or more hours of work each term) during the academic year 1946-1947.

It was found that veterans tended to take slightly lighter course loads than the nonveterans, the difference amounting to about half a credit-hour. Number of credits correlated positively with all the other measures, both predictors and criteria, but no systematic difference is apparent between veterans and nonveterans in the magnitude of the correlations. As in the other analyses where information on this point was obtained, the better students tend to take the heavier course loads. Comparing the means of the predictors, we find that the nonveterans are higher only on the ACPE Quantitative score and on High-School Average. Without exception the veterans exceed the nonveterans on the criterion variables.

Somewhat different results are obtained for veterans and nonveterans with regard to the validity of the predictors. For nonveterans, High-School Average is unquestionably the best predictor of quarter average grades, while for veterans the English test appears to be generally superior. For predicting grades in English, the English test is again relatively better for veterans than for nonveterans.

The analysis of covariance results are shown in Table 22. The ACPE and High-School Average were selected as the predictors, and the criterion was First-Year College Average Grade. The standard errors of estimate were significantly different at the 2 per cent level; grades of nonveterans tended to be more predictable. The equality of the slopes of the regression planes was not disproved, but the intercepts were found to be significantly different at the 1 per cent level. The test of the significance of the difference in intercepts is difficult to interpret in the light of the outcome of the test of Hypothesis A.

2. *Midwest State University*

Analysis of academic data for students in the College of Business of Midwest State University was limited to a comparison of achievement after allowing for differences in scores on the Ohio State University Psychological Examination.

Midwest State is a large coeducational state university located in a large city. Students who are residents of the state are admitted upon the completion of an appropriate high-school course of study. Students of business are required to take courses in English, economics, business, and geography, and to meet certain broader requirements during their freshman year. The group to be studied is defined as follows: students who entered as beginning freshmen

TABLE 22

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Midwest Technological University, College of Agriculture, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: H. S. Average Grade	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
1. ACPE (1945) Total (converted score)	MV		.38	.52	11.9	3.9	140
	MN		.49	.48	11.5	3.5	102
2. High-School Average Grade	MV	.38		.56	2.52	.64	140
	MN	.49		.68	2.75	.59	102
3. First-Year College Average Grade	MV	.52	.56		2.30	.60	140
	MN	.48	.68		2.15	.51	102

II. Multiple Correlations (Variables 1 and 2 vs. Variable 3): for MV, .65; for MN, .70; and for the combined group, .64.

III. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	5.425	1	Between .01 and .02
B. Equality of slopes	2.357	2	Between .30 and .50
C. Equality of intercepts	16.137	1	Less than .01

IV. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.23
Advantage expressed in standard error of estimate units	0.54
Per cent of veterans excelling the average nonveteran	71
Level of significance of difference (from IIIC above)	Ambiguous

in the fall of 1946 and who completed three quarters in the College of Business, including at least ten hours of work in each quarter. Students who were granted ten or more hours of credit in specific courses for training received during service were excluded from the group. The results for Midwest State business students are presented in Table 23.

The Ohio State University Psychological Examination (OSPE) proved to be a good predictor of freshman grades for both veteran and nonveteran students; the validity coefficients were .59 and .55. (The OSPE scores were converted to a standard scale having a mean of 13 and a standard deviation of 4.) Since high-school standing was reported in very coarse groupings (upper, middle, and lower third of the high-school class), it was not thought worth while to include it as a predictor. The criterion, which as usual was the First-Year College Average Grade, was based on a scale of five categories having the values of 4 to 0. The errors of estimate and slopes of the regression lines did not prove to be significantly different, but the intercepts were significantly different at the 5 per cent level.

3. *Littletown State University*

For students in the College of Business at Littletown State, analysis was limited to a comparison of the achievement of male veteran and nonveteran students, taking into account differences in total scores on the American Council Psychological Examination. The criterion again is First-Year College Average Grade.

Residents of the state were admitted to the College of Business upon completion of an appropriate course of study in high school. Those with poor high-school records were admitted on somewhat of a probationary basis.

TABLE 23

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Midwest State University, College of Business, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: OSPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
OSPE (converted score)	MV		.59	12.0	3.2	232
	MN		.55	13.2	4.0	58
First-Year College Average Grade	MV	.59		2.26	.65	232
	MN	.55		2.22	.70	58
Validity coefficient for combined group:			.57			

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	1.201	1	Between .20 and .30
B. Equality of slope	1.189	1	Between .20 and .30
C. Equality of intercepts	5.029	1	Between .02 and .05

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.18
Advantage expressed in standard error of estimate units	0.33
Per cent of veterans excelling the average nonveteran	63
Level of significance of difference (from IIC above)	5%

Students of business were required to take English and a survey course in business and to meet certain broader requirements during their freshman year. The group selected for study may be defined as follows: male students who entered as beginning freshmen in the fall of 1946 and who completed two semesters, including eleven or more hours of credit in each.

The results are presented in Table 24. No significant differences were found, in the analysis of covariance, although 59 per cent of the veterans exceeded the average nonveteran student in the College of Business at Littletown State.

4. *Summary*

Male veterans proved to be superior to male nonveterans with respect to college achievement (in relation to ability) at the single agriculture college and in both business colleges studied. The difference was significant at the 5 per cent level in one instance (Midwest State College of Business). The difference was not significant in the case of the business students at Littletown State, and was ambiguous for agriculture students at Midwest Tech.

The tendency for veterans to take lighter course loads than nonveterans was again found for agriculture students at Midwest Tech, and again the tendency was noted for the more able students to take heavier loads within each subgroup. High-school standing was again found to yield better prediction of grades for male nonveterans than for veterans.

TABLE 24

COMPARISON OF AVERAGE GRADES EARNED BY VETERAN AND NONVETERAN MALE STUDENTS

Littletown State University, College of Business, Freshmen, 1946–1947

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: ACPE	Correlation with: 1st-Yr. Average Grade	Mean	*SD*	*N*
ACPE Total (raw score)	MV		.55	106	23	142
	MN		.57	107	21	65
First-Year College Average Grade	MV	.55		2.34	.65	142
	MN	.57		2.23	.61	65
Validity coefficient for combined group:			.56			

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.347	1	Between .50 and .70
B. Equality of slopes	0.0191	1	Between .80 and .90
C. Equality of intercepts	2.436	1	Between .10 and .20

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.12
Advantage expressed in standard error of estimate units	0.23
Per cent of veterans excelling the average nonveteran	59
Level of significance of difference (from IIC above)	Not significant

E. GRADES OF INTERRUPTED VETERANS AND UNINTERRUPTED NONVETERANS

In the studies so far reported, the first-year average grade has been used as the primary criterion, and ability to do college work has been assessed on the basis of one or more tests of scholastic aptitude, tool skills, or achievement in high-school subjects, used wherever possible in combination with a measure of high-school standing. In the studies of interrupted veterans, however, the veteran is in a sense compared with himself as a nonveteran. The interrupted veteran, as defined here, is a student who attended college for a certain period of time (usually one year) as an ordinary civilian student, after which he entered military service; upon completion of his military service, he re-entered the same institution and completed a defined amount of academic work (usually one year). For such students it seemed that the best basis for evaluating the effect of the student's intervening experiences on college achievement was a comparison of his achievement as a civilian student (before war service) with his achievement as a veteran student.

In planning the analysis, it was thought likely that grades earned during the term just before the student entered the armed forces might not be typical, since the prospects of leaving college

shortly might lead the student to slacken his efforts in academic work. It was also supposed that grades for the first term following the return to college might not be typical, partly because background information and study skills might need refreshing before a student regained his original effectiveness, and partly because students returning to college might be temporarily fired with an enthusiasm which would not persist. In three of the five groups studied, the first-term grade was used as the predictor and the fourth-term grade as the criterion, leaving out of consideration the doubtful second and third terms. The analysis of covariance method was again used, in order to compare the second-term sophomore grades of veterans and nonveterans, taking account of ability as indicated by grades earned in the first term of the freshman year.

1. *Adams University*

A relatively elaborate study was made of the group containing interrupted veterans at Adams University, in order to obtain a more complete picture of the relationships of a number of pertinent variables. In this study, the typical definition of groups was made: veterans completed one year before war service and one year afterward; nonveterans entered in the fall of 1945 and completed two consecutive years of college work. Students not enrolled in the arts and science curriculum, and veterans given advanced standing for college training during their service were excluded.

The intercorrelations obtained for the two

TABLE 25

INTERCORRELATIONS OF SCHOLASTIC APTITUDE TEST SCORES, ADJUSTED SCHOOL RANK, PREDICTED GRADE, AND FIRST- AND SECOND-YEAR COLLEGE AVERAGE GRADES

Adams University, College of Arts and Science

(Veterans who completed one year before war service and one year after war service; nonveterans who entered in the fall of 1945 and completed two years.)

		Male Nonveterans (N=111)									
		SAT-V	SAT-M	Adjusted School Rank	Predicted Grade	1st-Sem. Average	2nd-Sem. Average	3rd-Sem. Average	4th-Sem. Average	Mean	S. D.
Interrupted Veterans (N=134)	SAT-Verbal		.33	.26	.72	.60	.53	.47	.46	559	107
	SAT-Mathematics	.28		.24	.55	.42	.23	.32	.22	574	93
	Adjusted School Rank	.31	.29		.62	.49	.41	.46	.48	74.7	8.2
	Predicted Grade	.67	.46	.73		.70	.63	.64	.64	74.5	7.3
	1st-Semester Average	.60	.34	.43	.63		.80	.72	.66	75.6	7.8
	2nd-Semester Average	.54	.22	.49	.66	.78		.73	.71	76.4	7.4
	3rd-Semester Average	.46	.39	.37	.55	.55	.52		.83	76.9	6.8
	4th-Semester Average	.48	.22	.31	.51	.59	.57	.80		78.0	6.7
	Mean	547	576	74.7	72.8	72.9	72.8	77.6	78.6		
	Standard Deviation	101	78	7.5	6.6	8.1	7.8	6.0	6.3		

subgroups are shown in Table 25. The statistics above and to the right of the diagonal were obtained for the nonveteran subgroup, and those below the diagonal for the interrupted veterans.

The hypothesis that First-Semester College Average Grades would furnish a better prediction of Fourth-Semester Grades than tests plus high-school standing was verified. For veterans, the Predicted Grade, which was the best of the ordinary predictors, correlated .51 with Fourth-Semester Average; the correlation of First-Semester Average with Fourth-Semester Average was .59. For the nonveteran subgroups, however, the difference was much less marked; the analogous correlations were .64 and .66.

It is of interest to note that the validity coefficients of the two scholastic aptitude tests against the fourth-term averages are rather similar for veterans and nonveterans, but the validities for Adjusted School Rank and Predicted Grade are noticeably lower after the interruption of training than during the initial college year. This finding is consistent with the previous observation that high-school standing ordinarily has less predictive value for veterans than for nonveterans.

It is also worthy of note that the intercorrelations of term grades which cross the time of interruption (i.e., all except first-semester vs. second-semester and third-semester vs. fourth-semester) are considerably lower for veterans than for nonveterans. This suggests that military service or other related experiences have affected the academic performance of the veteran students.

The means for the veterans are slightly lower on most of the predictive measures, and their First- and Second-Semester Average Grades are lower than for nonveterans. The average grades for the third and fourth semesters, on the other hand, are higher for veterans. It will be

TABLE 26

COMPARISON OF AVERAGE FOURTH-SEMESTER GRADES EARNED BY INTERRUPTED VETERAN AND UNINTERRUPTED NONVETERAN MALE STUDENTS

Adams University, College of Arts and Science

(Veterans who completed one year before war service, one year after war service; nonveterans who entered in the fall of 1945 and completed two years.)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: First-Sem. Average Grade	Correlation with: Fourth-Sem. Average Grade	Mean	*SD*	*N*
First-Semester College Average Grade	MV		.59	72.9	8.1	134
	MN		.66	75.6	7.8	111
Fourth-Semester College Average Grade	MV	.59		78.6	6.3	134
	MN	.66		78.0	6.7	111

Validity coefficient for combined group: .61

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.00474	1	Between .90 and .95
B. Equality of slopes	1.822	1	Between .10 and .20
C. Equality of intercepts	8.298	1	Less than .01

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	1.92
Advantage expressed in standard error of estimate units	0.38
Per cent of veterans excelling the average nonveteran	65
Level of significance of difference (from IIC above)	1%

noted that the mean Predicted Grade for veterans was 72.8 and the mean First-Semester Average was almost the same: 72.9. The nonveterans exceeded the prediction slightly more; the predicted mean grade was 74.5 and the mean of the First-Semester Average Grades was 75.6. In the second term, the veterans' mean was practically unchanged, while the nonveterans' mean grade increased slightly. There is then some slight evidence for believing that the anticipation of being drafted did lower the relative achievement of veterans to some extent.

The analysis of covariance results, comparing the regressions of Fourth-Semester Grades on First-Semester Grades for interrupted veterans and ordinary nonveterans, are shown in Table 26. The hypotheses of equal errors of estimate and equal slopes are not disproved, but the intercepts of the regression lines are found to be significantly different at the 1 per cent level. Sixty-five per cent of the interrupted veterans excel the average nonveteran in Fourth-Semester Grade when adjustment is made for ability differences as measured by First-Semester Average Grade.

This result is particularly striking in view of the results previously reported for the freshman veteran and nonveteran students at Adams; for the freshmen, no significant difference was found, although a relatively small difference would have been significant because so many students were included in the analysis. In the freshman group, only 52 per cent of the veterans excelled the average nonveteran.

2. *Stewart University*

At Stewart, the only variables taken into consideration were the average grades earned during the first four semesters of college work. As at Adams, the study involved a comparison of nonveteran students with veterans who had completed two full semesters of college work in the arts and science college, who were interrupted for military service, and who subsequently completed the two semesters of the sophomore year following their return from military duty. The nonveterans chosen for comparison entered in the fall of 1945, and completed two full years of college work. Transfer students and students given advanced standing for military training were eliminated. The predictor used was the First-Semester Average Grade, and the criterion was Fourth-Semester Average Grade. The grading system involved seven categories which were given the values of 7 to 1 for purposes of analysis.

The intercorrelations, means, and standard deviations of the four semester average grades for nonveterans and interrupted veterans are shown in Table 27. The intercorrelations are uniformly lower for veterans than for nonveterans, but the differences are especially large for

TABLE 27

INTERCORRELATIONS OF FIRST- AND SECOND-YEAR COLLEGE AVERAGE GRADES

Stewart University, College of Arts and Science

(Veterans who completed one year before war service and one year after war service; nonveterans who entered in the fall of 1945 and completed two years.)

		Male Nonveterans (N=70)					
		1st-Sem. Average	2nd-Sem. Average	3rd-Sem. Average	4th-Sem. Average	Mean	S. D.
Interrupted Veterans (N=55)	First-Semester College Average		.79	.73	.68	5.04	.99
	Second-Semester College Average	.74		.77	.72	4.91	.85
	Third-Semester College Average	.50	.46		.77	4.94	.92
	Fourth-Semester College Average	.67	.64	.70		5.13	.82
	Mean	4.88	4.77	5.29	5.38		
	Standard Deviation	.86	.95	.71	.68		

TABLE 28

COMPARISON OF AVERAGE FOURTH-SEMESTER GRADES EARNED BY INTERRUPTED VETERAN AND UNINTERRUPTED NONVETERAN MALE STUDENTS

Stewart University, College of Arts and Science

(Veterans who completed one year before war service, one year after war service; nonveterans who entered in the fall of 1945 and completed two years.)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: First-Sem. Average Grade	Correlation with: Fourth-Sem. Average Grade	Mean	*SD*	*N*
First-Semester College Average Grade	MV		.67	4.88	.86	55
	MN		.68	5.04	.99	70
Fourth-Semester College Average Grade	MV	.67		5.38	.68	55
	MN	.68		5.13	.82	70

Validity coefficient for combined group: .65

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	1.756	1	Between .10 and .20
B. Equality of slopes	0.0489	1	Between .80 and .90
C. Equality of intercepts	11.104	1	Less than .01

III. Difference between Subgroups with Ability Held Constant:

	Male Veteran
Superior subgroup	
Advantage expressed in grade units	0.32
Advantage expressed in standard error of estimate units	0.57
Per cent of veterans excelling the average nonveteran	72
Level of significance of difference (from IIC above)	1%

First-Semester vs. Third-Semester and Second-Semester vs. Third-Semester Average; the correlations are much lower for interrupted veterans than for the nonveterans, presumably because of influences related to the period of war service. It is interesting to note, however, that the correlations of First- and Second-Semester Averages with Fourth-Semester Average, which also bridge the period of interruption for veterans, do not show nearly as great a difference.

The means of veterans' grades are lower for both first and second semesters, but higher for third and fourth semesters than the grades of nonveterans. Both subgroups show a decrease in mean grade from the first semester to the second, and the difference is nearly the same for both subgroups. Apparently, either the anticipation of induction did not result in a letdown for the veterans, or the letdown was equally influential during both terms of the freshman year.

The magnitude of the intercorrelations between adjacent semester averages suggests that the grades are reasonably reliable.

Turning to Table 28, it will be seen that the correlations between the two semester grades employed as predictor and criterion were high: .67 for veterans and .68 for nonveterans. The analysis of covariance shows that differences in errors of estimate and regression slopes are not significant, while the difference in intercepts of the regression lines is significant at the 1 per cent level. Seventy-two per cent of the veterans exceed the average nonveteran in Fourth-Semester Grades when appropriate allowance is made for differences in First-Semester Grades.

3. *Eastern City University*

At Eastern City, the analysis was concerned only with First- and Fourth-Semester College Average Grades in arts and science. The groups studied were defined in the same manner as at Adams and Stewart. Uninterrupted nonveterans

TABLE 29

COMPARISON OF AVERAGE FOURTH-SEMESTER GRADES EARNED BY INTERRUPTED VETERAN AND UNINTERRUPTED NONVETERAN MALE STUDENTS

Eastern City University, College of Arts and Science

(Veterans who completed one year before war service, one year after war service; nonveterans who entered in the fall of 1945 and completed two years.)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: First-Sem. Average Grade	Correlation with: Fourth-Sem. Average Grade	Mean	*SD*	*N*
First-Semester College Average Grade	MV		.49	0.19	.68	70
	MN		.60	0.29	.65	99
Fourth-Semester College Average Grade	MV	.49		0.57	.58	70
	MN	.60		0.33	.60	99

Validity coefficient for combined group: .53

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.357	1	Between .50 and .70
B. Equality of slopes	1.374	1	Between .20 and .30
C. Equality of intercepts	13.779	1	Less than .01

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.29
Advantage expressed in standard error of estimate units	0.59
Per cent of veterans excelling the average nonveteran	72
Level of significance of difference (from IIC above)	1%

who entered in 1945 and who completed the sophomore year comprised the nonveteran subgroup; the interrupted veterans completed the freshman year before military service and the sophomore year after military service.

For the analysis of covariance, First-Semester Average Grade was used as the predictor; Fourth-Semester Average Grade served as the criterion. The grading system involved five categories having values +2 to −2. Transfer students and students enrolled for fewer than twelve credits in any of the four semesters were eliminated.

The relationship between First- and Fourth-Semester Grades was not as marked at Eastern City as at Adams and Stewart; the correlations were .49 and .60 for the two subgroups, as shown in Table 29. A similar pattern of mean grades was found, however. The results of the analysis of covariance are also similar to that of the other two institutions. The hypotheses of equal standard errors and equal slopes are not disproved, while the difference in intercepts is found to be significant at the 1 per cent level. Seventy-two per cent of the interrupted veterans are found to exceed the average nonveteran student.

4. *Midwest Technological University, College of Engineering*

At Midwest Tech, the nonveteran comparison group was composed of prewar students rather than a postwar group as in the three studies just discussed. In this study, it was possible to increase the size of the interrupted group considerably by introducing some flexibility into the defined pattern of interruption. In the three studies just discussed, the interruption occurred between the second and third semesters. At Midwest Tech a veteran whose college career was interrupted at any time after the second quarter and before the seventh quarter was considered to fall within the defined pattern,

provided that he completed at least eight quarters. As in the other studies of interrupted veterans, students who were given advanced standing for college training received as members of the armed forces were excluded. The nonveterans entered in the fall of 1939 and completed eight quarters of work; they were, of course, not interrupted. Transfer students and students who changed divisions within the university during the eight quarters were excluded from the study. Students who enrolled for fewer than 10 hours of work in any quarter or fewer than 12 hours in the first, second, or eighth quarter were also excluded.

A summer term counted as a regular quarter, provided the student was registered for twelve or more credit hours. Students were also rejected if they had not taken freshman mathematics or if they lacked a record of high-school standing. The same procedures described here apply to Midwest Tech College of Agriculture students; the study of the agriculture students will be described in the following section.

In the analysis of the data, First- and Second-Quarter College Average Grades were pooled and used as a single predictor; Eighth-Quarter Average Grades were used as the criterion. The results of the analysis are shown in Table 30. The validity coefficients tend to be somewhat lower than were found for the studies involving interrupted veterans at Adams and Stewart, probably because the criterion grades were earned at a time which is more remote from the predictor grades. The veterans were again found to earn lower grades during the initial two quarters (the predictor) than the nonveterans; on the Eighth-Quarter Grades (the criterion) the relative position of the two groups is reversed. The errors of estimate and slopes of the regression lines are not significantly dif-

TABLE 30

COMPARISON OF AVERAGE EIGHTH-QUARTER GRADES EARNED BY INTERRUPTED VETERAN AND UNINTERRUPTED NONVETERAN STUDENTS

Midwest Technological University, College of Engineering

(Veterans who completed two to six quarters before war service and two to six quarters after war service for a total of at least eight quarters; nonveterans who entered in the fall of 1939 and completed eight quarters.)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: 1 & 2 Quarter Average Grade	Correlation with: 8th-Quarter Average Grade	Mean	*SD*	*N*
First- and Second-Quarter College Average Grade	MV		.57	2.26	.72	140
	MN		.45	2.37	.64	215
Eighth-Quarter College Average Grade	MV	.57		2.43	.74	140
	MN	.45		2.38	.67	215

Validity coefficient for combined group: .50

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	0.0731	1	Between .70 and .80
B. Equality of slopes	1.496	1	Between .20 and .30
C. Equality of intercepts	2.640	1	Between .10 and .20

III. Difference between Subgroups with Ability Held Constant:

Superior subgroup	Male Veteran
Advantage expressed in grade units	0.11
Advantage expressed in standard error of estimate units	0.18
Per cent of veterans excelling the average nonveteran	57
Level of significance of difference (from IIC above)	Not significant

TABLE 31

COMPARISON OF AVERAGE EIGHTH-QUARTER GRADES EARNED BY INTERRUPTED VETERAN AND UNINTERRUPTED NONVETERAN MALE STUDENTS

Midwest Technological University, College of Agriculture

(Veterans who completed two to six quarters before war service and two to six quarters after war service for a total of at least eight quarters; nonveterans who entered in the fall of 1939 and completed eight quarters.)

I. Correlations, Means, and Standard Deviations:

Variable	Subgroup	Correlation with: 1 & 2 Quarter Average Grade	Correlation with: 8th-Quarter Average Grade	Mean	*SD*	*N*
First- and Second-Quarter College Average Grade	MV		.57	2.16	.63	57
	MN		.62	2.30	.60	106
Eighth-Quarter College Average Grade	MV	.57		2.62	.69	57
	MN	.62		2.44	.59	106
Validity coefficient for combined group:			.57			

II. Analysis of Covariance Results:

Hypothesis	Chi-square	Degrees of Freedom	Probability that a value greater than obtained would arise by chance
A. Equality of errors of estimate	2.901	1	Between .05 and .10
B. Equality of slopes	0.0000	1	Greater than .99
C. Equality of intercepts	9.255	1	Less than .01

III. Difference between Subgroups with Ability Held Constant:

	Male Veteran
Superior subgroup	
Advantage expressed in grade units	0.26
Advantage expressed in standard error of estimate units	0.51
Per cent of veterans excelling the average nonveteran	69
Level of significance of difference (from IIC above)	1%

ferent. The difference in intercepts is also found to be within the range of chance expectancy; 57 per cent of the interrupted veterans excel the average nonveteran. This engineering group at Midwest Tech is the only group among the five involving interrupted veterans where college achievement in relation to ability did not yield a statistically significant difference in intercepts.

5. *Midwest Technological University, College of Agriculture*

For Midwest Tech students of agriculture, the definition of the veteran and nonveteran groups and the plan of the analysis were in all respects parallel to those for the students of engineering described in the previous section.

Results of the analysis for this group are shown in Table 31. The differences in means show the same trend as did the preceding groups involving interrupted veterans: the veterans earned lower grades on the predictor and higher grades on the criterion measure. The advantage of the interrupted veterans is found to be significant at the 1 per cent level. Sixty-nine per cent of the interrupted veterans excel the average nonveteran at the Midwest Tech College of Agriculture with respect to Eighth-Quarter Grades when differences appearing in grades for the first two quarters are taken into account.

6. *Summary*

In all five comparisons of interrupted veterans with male nonveterans, the veteran subgroup was found to be superior to nonveterans in achievement relative to ability. In these five comparisons, ability was measured in terms of freshman

college grades. In four of the five comparisons the difference was significant at the 1 per cent level. The differences were generally greater in comparisons involving interrupted veterans than in the comparisons involving freshman students where ability was measured by tests and high-school standing.

In all five of the studies it was noted that the interrupted veterans had lower mean scores for freshman grade than the nonveteran male students. This fact must be taken into account in interpreting the analyses of covariance results. For example, if the lower freshman grades are the result of a tendency to let down on effort in anticipation of being drafted, the effects of the interruption would be primarily a matter of depressing achievement before service rather than enhancing achievement after service.

In addition to the possibility that the freshman grades of the interrupted veterans were low because of a feeling that college work was unimportant in view of the war emergency, particularly since their college career might be interrupted before the end of the college year, there are other reasonable interpretations. One possibility is that there might have been a tendency for faculties to give higher grades in 1945, when the nonveterans were freshmen, than in the period two or three years earlier when the veterans were freshmen. Another possibility is that selective factors of some sort were operating which tended to lower the means for the interrupted veteran subgroups who returned without advanced standing gained in the various college training programs sponsored by the armed services. This seems a likely possibility, since students who were known to have had college training while in the service were excluded from the study.

No direct evidence is available bearing on the hypothesis of a letdown in anticipation of being drafted except the slight suggestion from the separate semester means at Adams that there might have been a letdown in the second term: the second-semester mean grade increased slightly over the first-semester mean grade for nonveterans, while for veterans there was a slight decrease. A similar result was not found at Stewart, however. It would appear that if there was a letdown, it affected both terms of the freshman year to about the same extent.

Evidence from Eastern City and Stewart University records shows that mean freshman average grade is rather stable from year to year, which casts doubt on the hypothesis of grades drifting upward. In addition, it has been shown that the relationships of the mean grades are the same at Midwest Tech, where the nonveterans entered in 1939, as at the other three institutions. The hypothesis of grades drifting upward over the years is not necessary to account for the differences at Adams. The percentile equivalents of semester averages were obtained, based on the entire class for that term; the percentile equivalents of the First- and Second-Semester Averages for the median interrupted veterans were about 35, while for the nonveterans the percentiles were about 55.

The most probable explanation of the lower freshman grades of the interrupted veterans is that selective factors were operating. Students with the best academic records are somewhat more likely to have been rejected in our editing procedure because they were retained in ASTP or V-12 college training programs or because they were selected for other types of military training which resulted in their being given advanced standing.

F. Trends in the College Grades of Veterans and Nonveterans

As has previously been mentioned, it is possible that veteran students are initially handicapped because of such factors as forgetting and deterioration of study skills, which result in temporary underachievement. Another possibility is that the veterans return to college fired with enthusiasm and good intentions, which lead to temporary overachievement. It is also, of course, possible that both these effects occur, in the same student or in different students, and that they tend to cancel each other. It was accordingly thought worth while to examine the trends in grades of veteran and nonveteran students.

Average grades by terms were obtained for six groups, including the groups at Adams and Stewart which involved interrupted veterans. The average grades earned in successive terms by veteran and nonveteran male students are shown in Figures 3 and 4. It will be noted that the entire scale of grades has been shown on the graphs for all universities except Adams. This fact should be kept in mind in interpreting the graphs, since the variation among average grades for large groups of students is not likely to be great relative to the complete scale of grades in use.

The results for interrupted veterans at Stewart and Adams, shown graphically in Figure 3, have already been described in the preceding discussions of the academic data. At Adams, the veterans do not show the slight increase in second-semester average grade which is present for the nonveterans, which suggests there may have been some letdown in effort in anticipation of being drafted. At Stewart, however, no such trend is found. Apparently any reduction in effort resulting from the imminence of

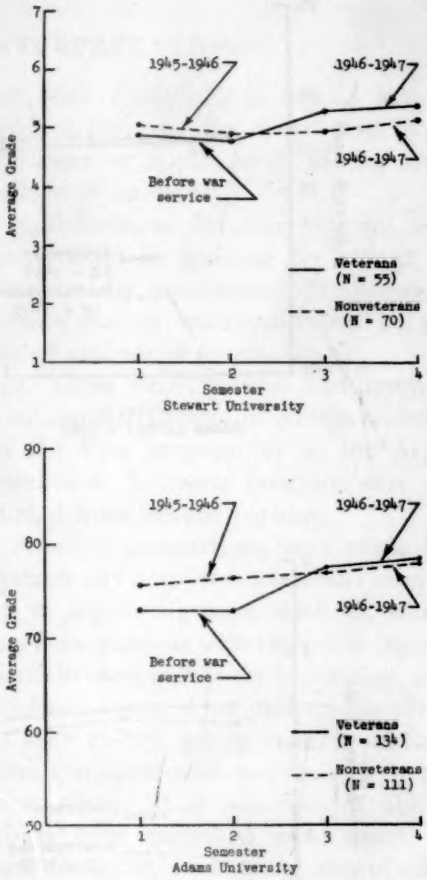

Fig. 3. Trends in Grades of Interrupted Veterans and Uninterrupted Nonveterans

withdrawing from college for military service had about the same effect on both semesters. At Adams, the line showing average grades for the semesters following return from war service is almost exactly parallel to the line for nonveterans. At Stewart there is some suggestion that the veterans did relatively better in the third term than in the fourth. The absence of any marked trend in the second-year mean grades of interrupted veterans suggests that forgetting or deterioration of study skills was not an important determiner of postwar achievement. If such deterioration did occur, it was apparently more than counter-

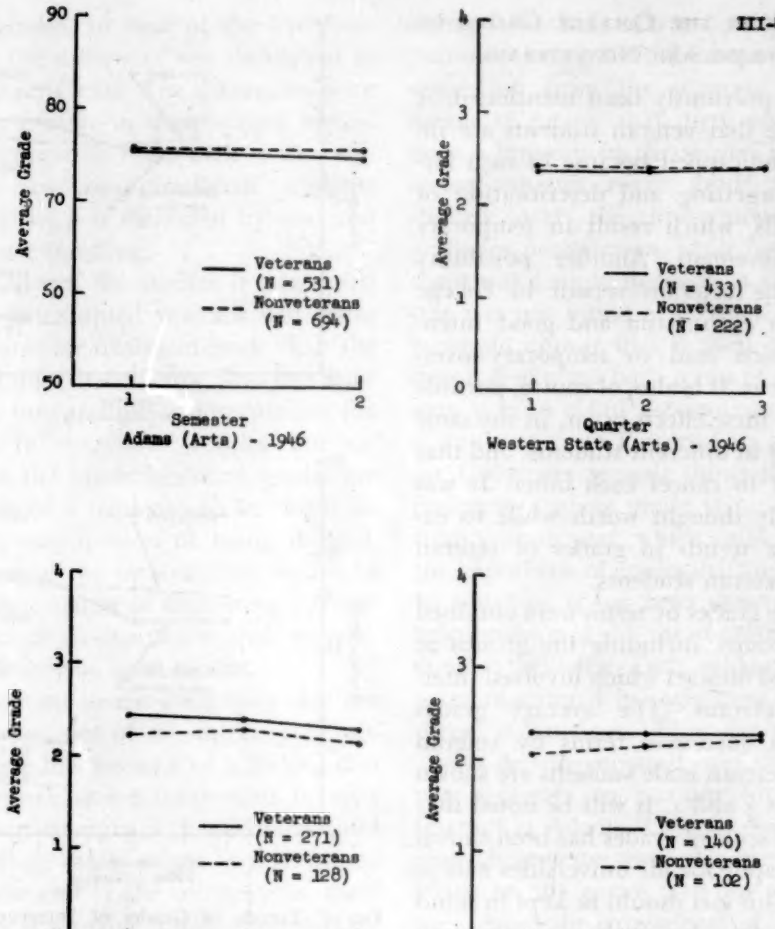

FIG. 4. Trends in Grades of Veteran and Nonveteran Male Students

balanced by influences favorable to success.

Mean term grades were computed for groups of veteran and nonveteran males who entered as freshmen in the fall of 1946 at three institutions—Adams, Western State, and Midwest Tech; at the latter institution, such data were available for both engineering and agriculture students. These means are shown graphically in Figure 4. The lines for veterans and nonveterans are nearly parallel in all four cases. At Midwest Tech there is a slight tendency for the difference between veterans and nonveterans to be greatest in the first of the three terms. There is again no consistent evidence that veterans are more handicapped at the start because of such factors as forgetting; if anything, the tendency is for veterans to do relatively better in the first term after war service than in subsequent terms.

III. SUMMARY AND INTERPRETATION

The academic success of veterans in college was early recognized as an important subject for investigation because of its relevance to long-range formulations of educational and public policy. It was clear that the performance of veterans had an important bearing on two major issues in higher education: who should go to college? and at what age should the typical student enter college? It was also clear that the performance of veterans in college was relevant to the problem of predicting college success, a matter which has received considerable attention from psychologists, especially during the past thirty years.

A major purpose of the present study was to provide a reasonably clear answer to the question: how did veterans and nonveterans differ with respect to academic success? On examination of this question, it became evident that a number of specific steps must be taken in order to minimize influences which might obscure the differences and thus present a misleading estimate of their importance. In particular, the following procedures were carried out:

1. Recognizing the diversity of American colleges and universities, studies were made in cooperation with 16 colleges and universities so chosen as to include private colleges, state universities, and municipal universities; coeducational and men's colleges; large universities and relatively small colleges; colleges with great financial resources and less wealthy institutions; and colleges located in large cities as well as colleges in small towns.

2. The crucial comparisons in this study were between *male* veterans and *male* nonveterans who were enrolled in the *same* division (e.g., liberal arts or engineering), in the *same* class (e.g., freshman or sophomore), of the *same* college or university.

3. Differences between veterans and nonveterans in aptitude for college, as measured by conventional predictors of college success, were controlled by the use of analysis of covariance.

4. Those veterans who had received a substantial amount of college training in the V-12 program or in the Army Specialized Training Program were excluded from the comparisons.

Separate comparisons were made for veteran and nonveteran students in each of 25 separate groups, each of which was homogeneous with respect to institution, division within the institution, and academic status of the students. In effect, in each college group veteran students were compared with nonveterans *of the same ability*. The estimates of ability which were employed were based, in most instances, on a test or tests of scholastic aptitude and achievement, or on a measure of high-school success used in combination with a test or tests of aptitude and achievement.

What, then, were the findings with respect to veteran-nonveteran differences in Adjusted Average Grade? In Figure 5, 25 separate answers are provided, one for each group studied. Let us consider first the results for the 20 groups containing freshman students.

For ease of interpretation, the results are presented in terms of the percentage of veterans excelling the average nonveteran in freshman average grade adjusted in such a manner that any ability differences between veterans and nonveterans have been cancelled. If veterans

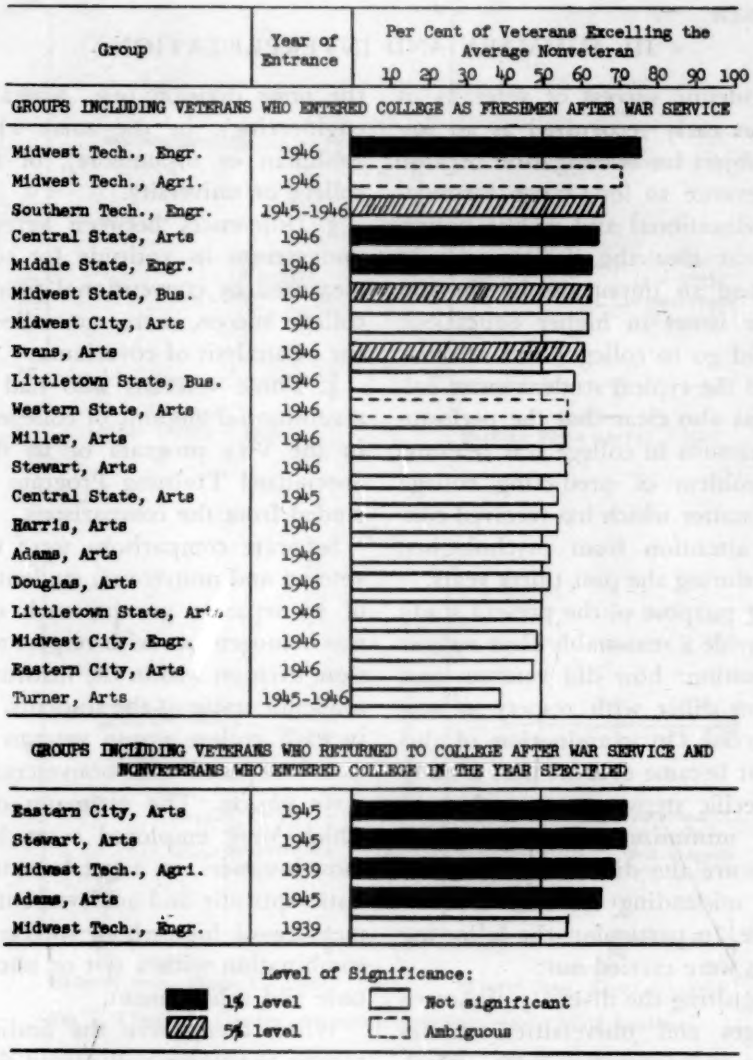
Group
Year of Entrance
Per Cent of Veterans Excelling the Average Nonveteran
10 20 30 40 50 60 70 80 90 100
GROUPS INCLUDING VETERANS WHO ENTERED COLLEGE AS FRESHMEN AFTER WAR SERVICE
Midwest Tech., Engr. 1946
Midwest Tech., Agri. 1946
Southern Tech., Engr. 1945-1946
Central State, Arts 1946
Middle State, Engr. 1946
Midwest State, Bus. 1946
Midwest City, Arts 1946
Evans, Arts 1946
Littletown State, Bus. 1946
Western State, Arts 1946
Miller, Arts 1946
Stewart, Arts 1946
Central State, Arts 1945
Harris, Arts 1946
Adams, Arts 1946
Douglas, Arts 1946
Littletown State, Arts 1946
Midwest City, Engr. 1946
Eastern City, Arts 1946
Turner, Arts 1945-1946
GROUPS INCLUDING VETERANS WHO RETURNED TO COLLEGE AFTER WAR SERVICE AND NONVETERANS WHO ENTERED COLLEGE IN THE YEAR SPECIFIED
Eastern City, Arts 1945
Stewart, Arts 1945
Midwest Tech., Agri. 1939
Adams, Arts 1945
Midwest Tech., Engr. 1939
Level of Significance:
1% level
5% level
Not significant
Ambiguous

FIG. 5. Per Cent of Veterans Excelling the Average Nonveteran with Respect to Adjusted Average Grade in Each of Twenty-Five College Groups

and nonveterans were exactly alike, the two adjusted-grade distributions and the mean adjusted grades would coincide, and 50 per cent of the veterans would be found to excel the average nonveteran. If veteran students are slightly superior, the two distributions will not coincide but will overlap, and that proportion of the veterans' distribution which falls to the right of the mean for nonveterans will exceed 50 per cent.

Referring to Figure 5 we may note the two most extreme cases: 76 per cent of the veterans excelled the average nonveteran in adjusted grade in the engineering school of Midwest Tech (a mid-

western land-grant college), while at the opposite extreme only 39 per cent of the veterans excelled the average nonveteran at Turner (a private coeducational university). In the latter case the veterans were inferior to the nonveterans.

Veteran superiority in grades relative to ability is then not a universal tendency. What about the over-all results? It will be observed that in 16 of the 20 comparisons involving freshman students the veteran subgroup was superior; one would expect by chance to find 16 out of 20 differences in one direction less than 5 times in a hundred trials. This result in itself, being significant at the 5 per cent level, may be considered as moderately convincing evidence of superiority of veteran students in academic work when ability differences are kept constant. In the remaining four comparisons the nonveterans were superior (although for liberal arts students at Littletown State the superiority of the nonveterans is too small to be apparent in Figure 5).

Are the differences between veterans and nonveterans statistically significant in each of the 20 college groups now being discussed? Evidence on this question is shown by the shading of the bars in Figure 5. The black bars indicate a highly significant difference (the 1 per cent level of confidence), the diagonally shaded bars indicate significance at the 5 per cent level, and the white bars indicate results which are not significant at the 5 per cent level. Bars outlined with broken lines indicate that the results of the significance test were ambiguous (because of technical considerations related to the fact that errors of estimate are greater for one subgroup than for the other).

In three of the comparisons, those for engineering students at Midwest Tech and Middle State and for liberal arts students at Central State who entered in 1946, the veterans are significantly superior (at the 1 per cent level) to nonveterans. In three additional comparisons the differences are significant at the 5 per cent level. The remaining ten comparisons which showed veterans to be superior were either ambiguous or not significant (at the 5 per cent level). In none of the four cases where nonveterans were superior was the difference significant.

On the whole, therefore, it must be concluded from the studies of freshman students that there *is* a tendency for veterans to achieve higher grades in relation to ability than do nonveteran students, but the magnitude of the difference is small. In the most extreme case, the advantage of the veterans would on the average amount to no more than the difference between a "C" and a "C+." In other institutions the difference was much smaller, and, as we have seen, the direction of the difference is even reversed in some colleges.

Now let us consider the remaining five comparisons—those involving "interrupted" veterans. Substantially all the veteran students in these five comparisons were those who had completed at least two quarters of freshman work as ordinary civilians, who then entered military service, and who returned to college after discharge and completed at least an additional two quarters of academic work. The nonveterans with whom the interrupted veterans were compared were ordinary civilian students who completed without interruption the same amount of academic work as the veterans. In three of the college groups these nonveterans were postwar students

who entered college as freshmen in 1945, but at Midwest Tech they were prewar students who had entered in 1939. In all five of these groups, college grades earned early in a student's academic career were taken as the measure of his ability; those earned later in his college career were used as the measure of his academic success. For the veterans, of course, a considerable amount of time elapsed between their early and later academic work.

In all five groups involving interrupted veterans, veteran students were superior to nonveterans of equal ability. In four of the five comparisons, the difference in adjusted grade was significant at the 1 per cent level. The proportion of veterans who excelled the average nonveteran ranged from 72 per cent at Eastern City and Stewart to 57 per cent at the Midwest Tech engineering school. The evidence from these studies of interrupted students thus strongly supports the hypothesis that veterans do excel nonveterans of equal ability with respect to achievement in college.

The interpretation of the differences found between veterans and nonveterans in these five groups is particularly difficult. At first glance, it would appear that the veterans had gained greater maturity and a capacity for more intensive and prolonged effort during their absence from the campus; accordingly, they showed a marked gain over their initial performance—in contrast to the relative stability of performance shown by a nonveteran group whose careers were not interrupted. Such an interpretation would overlook two important complications: first, the possibility that shifts in grading standards over a period of time might influence the results; and second, the fact that in all five groups the veterans earned *lower* freshman grades than did their nonveteran controls. The hypothesis that grading standards shifted is weakened by the fact that in three of the groups the veterans were compared with a postwar nonveteran group (students entering in 1945) while in the other two the nonveteran comparison group was a prewar group (students entering in 1939). The advantage of the nonveterans in their *freshman* grades constitutes a more serious problem. Among the hypotheses which may be advanced to account for this finding, two appear to be most plausible: first, the members of the veteran group, realizing that their academic careers were likely to be interrupted by war service, may have slackened their efforts; and second, the necessary exclusion from the comparisons of veterans who continued their academic careers in V-12 or ASTP may have removed a disproportionate number of superior students, and thus lowered the average in the remaining group. With these limitations in mind, it must be recognized that the findings are not as conclusive as the significance tests might indicate. The findings, in spite of the limitations, may properly be considered to favor the veteran group.

In addition to the comparisons of male veterans and male nonveterans, study was made of a number of problems which were considered pertinent to the interpretation of the findings or which were by-products of the plan of analysis followed in making the basic comparisons. These problems were studied in varying numbers of groups; no attempt was made, however, to exhaust the possibilities of the available raw data in seeking answers to them.

One question, studied in three groups, was the possible significance of academic

load, as measured by the number of credit hours carried. In all three instances, it was found that veterans tended to take a slightly lighter load. This might merely be a reflection of the fact that veterans were generally not required to take physical education or military science. It was also found that correlations between work load and measures of ability and college achievement are consistently positive—students who take the heavier load tend to get the higher grades in college. This tendency was consistently found both for the veteran subgroups and the nonveteran subgroups. This finding tends to discount the hypothesis that veterans did better because of a reduced course load, although it does not provide an adequate basis for rejecting it.

It is important to study the relationship between the time when aptitude tests were taken by veterans and the scores which they earned. In two institutions where the College Entrance Examination Board Scholastic Aptitude Test was used, some veterans had applied for admission and were tested before leaving for war service and some were tested after discharge. This variable, date of testing, was correlated with all the measures of ability and college achievement. The correlations tended to be quite low, indicating that date of testing, within the range encountered in these studies, is of little importance. This finding is reassuring in the interpretation of the results, since in most of the groups the veterans were tested after war service, several years after high-school graduation, while the nonveterans were tested a few months after graduation from high school.

It is pertinent to inquire whether any difference in outcome of analyses of covariance is apparent in the groups for which both high-school standing and various test scores were used as compared with those groups for which only test scores were used. As it happened, there were 10 groups of each type among the 20 groups of entering freshmen. The general outcome of this comparison is shown in Figure 6. The median value of the percentage of veterans excelling the average nonveteran is 56 in both sets. However, the range in percentage of veterans excelling the average nonveteran

Per Cent of Veterans Excelling the Average Nonveteran	Predictors Used	
	High School Standing in Combination with a Test or Tests	A Test or Combination of Tests without High School Standing
78 or higher		
73 to 77	•	
68 to 72	×	
63 to 67	••	••
58 to 62		•oo
53 to 57	ooo×	o
48 to 52	oo	ooo
43 to 47		
38 to 42		o
33 to 37		
28 to 32		
23 to 27		
22 or lower		

• Difference significant at or beyond 5% level

o Difference not significant

× Outcome of analysis ambiguous

FIG. 6. Distribution of Per Cent of Veterans Excelling the Average Nonveteran with Respect to Adjusted Average Grade for the Ten Groups in Which High-School Standing Was Used in Combination with a Test or Tests and for the Ten Groups in Which Tests Only Were Used

is 48 to 76 in the groups where high-school standing was used, and the range is 39 to 66 in the groups where tests alone were used. This suggests that the inclusion of high-school standing as a predictor is associated with findings which are slightly more favorable to the veteran group.

Finally, attention was given to possible trends in grades which veteran students earned in successive terms after war service. Examination of the mean grades of veterans and nonveterans shows no evidence that veterans were seriously handicapped at the beginning of the college work because of forgetting or deterioration of study skills, nor that there was a period of initial enthusiasm which led to marked temporary overachievement. In four comparisons of this type, no clear indication of a consistent shift in differences of grades was found; if forgetting does play a role in grades earned by veterans immediately after their entrance to college, it is apparently counterbalanced by other factors such as a more enthusiastic approach to the study situation.

Accepted for publication, February 28, 1952.